



THE UTILITY OF USING A THIRD PARTY
IN MILITARY TO COMMERCIAL
TECHNOLOGY TRANSFER

THESIS

David A. Taylor, Captain, USAF

AFIT/GSM/LAS/96S-7

DTIC QUALITY INSPECTED 8

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

AFIT/GSM/LAS/96S-7

THE UTILITY OF USING A THIRD PARTY
IN MILITARY TO COMMERCIAL
TECHNOLOGY TRANSFER

THESIS

David A. Taylor, Captain, USAF

AFIT/GSM/LAS/96S-7

Approved for public release; distribution unlimited

19970218 001

The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

THE UTILITY OF USING A THIRD PARTY IN
MILITARY TO COMMERCIAL TECHNOLOGY TRANSFER

THESIS

Presented to the Faculty of the Graduate School of
Logistics and Acquisition Management
of the Air Force Institute of Technology
Air University
Air Education and Training Command
in Partial Fulfillment of the Requirements for the
Degree of Master of Science in Systems Management

David A. Taylor, B.S.

Captain, USAF

September 1996

Approved for public release, distribution unlimited

Acknowledgments

I am indebted to my thesis advisor, Major Richard Franza, who gave me the freedom to make mistakes and to learn and grow from the thesis experience. His suggestions and support while pursuing this research effort have been tremendous. I especially want to thank him for his advice and help when this effort strayed. I would also like to thank my reader, Dr. Craig Brandt, for his intuition and fresh perspective.

A special thanks to all those at Wright Laboratory and Wright Technology Network who took the time to answer my questions and help with the data collection. Their assistance has been invaluable. I also want to thank my classmates who gave me support during the AFIT and thesis journey. Our friendships will last a lifetime.

Finally, I want to thank my wife and children for their support and understanding during the thesis process. Their patience and love has carried me through the AFIT experience.

David A. Taylor

Table of Contents

	Page
Acknowledgments	ii
List of Figures	vi
List of Tables	vii
Abstract	viii
I. Introduction.....	1
General Issue.....	1
Research Objective	5
Thesis Overview	6
II. Literature Review	7
Introduction	7
Technology Transfer: Legislation and Policy	7
Technology Transfer Issues	9
Mission.....	9
Jobs.....	9
Competitiveness.....	10
Dissemination	13
Technology Transfer Process	13
Model One.....	13
Model Two.....	14
Previous Studies	17
Services to the private firm:	18
Services to the laboratories:	18
Recommendations for the federal government:	19
Recommendations for intermediary-organizations:	19
Conclusion	22
III. Methodology	23
Introduction	23

	Page
Case Study Background	23
Population	25
Research Instrument	26
Data Analysis	27
WTN Management and Points of Contact	28
WL Management, Transfer Focal Point, and Scientist and Engineers	29
Conclusion	31
IV. Results and Analysis	32
Introduction	32
Technology Transfer: AFMC Direction.....	32
Strategy	33
Technology Identification	34
Marketing	34
Vehicle Identification	35
Transfer	36
Post-Transfer Administration	36
Technology Transfer at Wright Laboratory	38
ORTA/Focal Point Perspective	38
S&E Perspective.....	44
WTNs Perspective	47
Analysis.....	48
WTN Capabilities	49
Processes WTN Supports	50
WTN Capabilities not Used.....	50
Conclusion	51
V. Conclusions and Recommendations	52
Introduction	52
Conclusions.....	52
Verified Conclusions.....	53
Unique Conclusions	54
Areas for Future Studies	55

	Page
Appendix A: Local Area Process Steps.....	57
Appendix B: Questions.....	60
Appendix C: Transfer Mechanisms	72
Appendix D: Interview Data.....	75
WTN Management - President.....	75
WTN Management - Chief Technical Officer	77
WTN Technical Specialist.....	81
WTN Technical Specialist.....	85
WTN Technical Specialist.....	90
WL Management.....	94
WL Management.....	100
WL ORTA	104
WL Focal Point	108
WL S&E	111
Bibliography.....	116
Vita.....	118

List of Figures

Figure	Page
1. Transfer as the Systems Engineering Model.....	14
2. The Master Process.....	14
3. Who Works the Various Steps.....	32

List of Tables

Table	Page
1. R&D Leaders	12
2. Conclusions Summary	52

Abstract

In the wake of the defense drawdown and end of the Cold War, government laboratories are facing a changing mission. It is not only to maintain technology superiority, but also to promote commercialization of their technologies. Although Congress has tried to facilitate technology transfer from the government to the private sector, the transfer process has been inconsistent. The need for assistance has initiated the use of third parties or intermediaries in the technology transfer process.

This thesis evaluates the utility of a third party in the technology transfer process. An examination of Wright Technology Network (WTN), a third party, is used to form a case study of its value added to Wright Laboratory (WL) in striving to meet WL's mission. Interviews with employees at WTN and WL are used to obtain the data for this case study.

The key findings of this research suggest recommendations that can be applied to understand the utility of third parties. Some key findings found include: Third parties assist firms in targeting and defining a technology problem or interest and third parties facilitate the transfer process through their ties with industry. Opportunities for additional research in this area are also offered.

THE UTILITY OF USING A THIRD PARTY IN MILITARY TO COMMERCIAL TECHNOLOGY TRANSFER

I. Introduction

General Issue

In the wake of the defense drawdown and end of the Cold War, government laboratories are facing a changing mission. Federal laboratories started in the late 1940s and early 1950s with their original purpose to support one national security goal: support military superiority through advanced technology (Shahidi and Xue, 1994: 150). The end of World War II brought the need for the U.S. to build up and maintain its technological superiority. As a result, the bulk of research and development (R&D) performed in the last forty years in universities, federal labs, and institutions as well as the industrial military complex has focused on supporting this technology policy (Shahidi and Xue, 1994: 150). These organizations did not focus on using their R&D facilities to assist commercial firms. The nation's security was at stake, and laboratories could not risk their technology to be used by commercial firms for fear it end up in the hands of potential enemies. Some technology developed was found to have potential commercial use, but no formal process

had been established to transfer the technology. The government was also reluctant to sign contracts that gave a single firm exclusive rights to a particular technology, because such action would give the firm a marketplace advantage (Charles, 1988:874). This reluctance was derived from the mentality that if the public pays for anything, then it should be free to anyone (Charles, 1988:875). Because the government felt this way, commercial companies saw little value investing in laboratory technology. Industry is unanimous in believing that what is available to everybody is worthless (Charles, 1995:875). Therefore, the only way Congress could encourage federal laboratories and commercial firms to work together to promote the economic well-being of the U.S. was through the establishment of laws to encourage the transfer of technology.

In order to better understand what is meant by technology transfer and why it is so important, one needs to look at the definition of technology transfer. Technology transfer is "the transfer of physical devices, processes, 'know-how', or proprietary information about devices or processes from one organization or institution to another" (Bozeman, 1991:232). For purposes of this study, technology transfer will be limited to the use of this transfer process from federal laboratories to the private sector. The next step to understanding technology transfer is a look into its history.

Beginning in 1980, Congress began enacting legislation aimed at facilitating technology transfer between the federal laboratories and the private sector. The aim of Congress was to promote the competitiveness of the U.S. industries in an international market. The first law was the Stevenson-Wydler Technology Innovation Act of 1980 which defined a primary mission of federal labs to be technology transfer (Bodde, 1993:

274). The next two laws passed, the Federal Technology Transfer Act of 1986 and the National Competitiveness Technology Transfer Act of 1989, introduced cooperative research and development agreements (CRDAs) between the government and private industry (Bodde, 1993:274). These laws have created ways to facilitate technology transfer, but studies have shown that the government needs to be more active in promoting industrial competition through technology transfer. Some of the findings from these studies show that the government must adopt an enabling perspective toward U.S. corporations by which:

- Federal regulations must not encourage companies to get out of the business or shift their manufacturing offshore when products enter a commodity phase.
 - Intellectual property rights need to be strengthened so companies can further leverage the R&D excellence of companies, federal laboratories, and universities.
 - Federal R&D must increase its relevance to commercialization of products.
- (Gover, 36-38)

The primary mission of the federal labs is expanding. It is not only to maintain technology superiority, but also to promote commercialization of products. But federal laboratories are not the only organizations providing state of the art technology. Industrial firms have created their own labs or research facilities, striving to develop technology that will help their firms maintain a competitive edge. Industry has overtaken the federal labs in its ability to develop technology faster and cheaper. Now is the time for federal labs and industrial firms to work together. John M. Deutch, Deputy Secretary of Defense, said the following on this issue:

"The technology superiority of U.S. forces contributes to reduced casualties and quicker victories. This superiority must be maintained today under circumstances

profoundly different from those of even the recent past.... Now the cold war is over. U.S. defense resources have been reduced accordingly. We must increasingly turn to commercial or commercially derived products for our needs, taking advantage of both economies of scale and of cutting edge technologies that are now increasingly to be found in the commercial sector.... That means we must also develop approaches that will enable us to maintain our edge even when our potential adversaries have access to the same basic technologies.”

(Defense Science and Technology Strategy, Sep 1994)

This quote states the new mission of the federal laboratories and the federal acquisition community. Cutting edge technology produced in the commercial market must be found and used. Does this mean that federal laboratories are no longer needed? No, this only augments their mission. Federal laboratories no longer need to develop every piece and type of technology to be used in a weapon system. If cutting edge technology is found in the commercial sector, federal laboratories should allow commercial firms to produce the new technology and focus on areas that are not available in the commercial sector. While focusing on technology that is cutting edge, but not available in the commercial market, the federal laboratories will be developing new technology that may eventually be transferred to the commercial sector. This is the point of the mission augmentation. However, the laboratories are inexperienced in the technology transfer process and how to bring the commercial sector and the federal laboratories together.

Although the laws passed by Congress have been enacted to bring federal laboratories and commercial firms together, government agencies have been slow to implement the new policies in the field. As late as 1990, nearly a third of the federal laboratories had received no guidance from their parent agencies on how to implement the 1986 Technology Transfer Act (Bodde, 1993: 275). Along with the problem of federal

laboratories not getting “into the game” of technology transfer is the problem that industry is not interested in what is available. Brookhaven National Laboratory states that they are visited by the venture capitalists who wander in with hopes of finding a technology nugget, but realize that products are not sitting on the shelf waiting to be moved into the commercial sector (Baron, 1990:39). Although Congress has tried, the technology transfer process has not been completely implemented. This need for assistance is what has initiated the use of third parties or intermediaries. The terms third party, intermediary, broker, and transfer agent will be used interchangeably to mean a person or organization that assists the technology transfer process from a federal laboratory to industry.

Research Objective

The objective of this research project is to determine if the use of third parties or brokers can facilitate and promote technology transfer from government laboratories to commercial firms.

The premise behind this objective is to determine if both government and industry can benefit from the use of a broker service or third party to advance technology developed in the government laboratory. An examination of technology brokers attempts to answer the following questions:

1. What is the value to the government of using a third party to promote the transfer of technology?
2. What do the current brokers do well that the government laboratory and/or local firms can not do on their own?
3. What are the qualifications/characteristics of the third party (personnel, resources) that allows them to add value?

4. What are the different services that third parties can offer to the government?

Thesis Overview

In Chapter II, a literature review is presented that focuses upon the technology transfer process, relevant legislation, and previous research. Chapter III describes the case study methodology used in this research, the population of interest, and research instruments used. Chapter IV introduces the organization studied and illustrates how they aid in the defense conversion process by facilitating technology transfer activities. Chapter V contains conclusions and recommendations for future research.

II. Literature Review

Introduction

Technology transfer is an area of concern to government and industry personnel that has been gaining momentum since the 1980s. Many issues exist on how technology transfer is being used and conducted right now. One of these issues is how effectively and efficiently technology is disseminated from defense laboratories to industry. This chapter defines technology transfer and reviews its history, identifies technology transfer issues, examines the technology transfer process, and reviews past studies concerning intermediaries aiding in the transfer of technology.

Technology Transfer: Legislation and Policy

For purposes of this study, technology transfer is limited to transfer from the government to the private sector. The thrust of government to private sector technology transfer began with the Stevenson-Wydler Technology Act of 1980. This legislation officially added technology transfer to the mission of the federal laboratories. The Act required one half of one percent of each federal agency's budget be set aside for technology transfer, but added escape provisions that made this requirement meaningless in practice (Bodde, 1993: 274). The University and Small Business Patent Procedures Act of 1980, amended in 1984 and now known as the Bayh-Dole Act, allows small businesses and not-for-profit institutions operating federally-funded laboratories to take title to the patents created in the course of their work. Two other laws, the Federal Technology Transfer Act of 1986 and the National Competitiveness Technology Transfer Act of 1989,

authorizes all federal laboratories to enter into cooperative research and development agreements (CRDAs) with private companies. In this agreement, the private partner provides equipment, personnel, or financing for a specific research project that meshes well with the mission of the government laboratory (Bodde, 1993:274). The Federal Technology Transfer Act of 1986, as amended, requires that each federal laboratory with 200 or more full-time scientific, engineering, and related positions to have at least one full-time office of research and technology application (ORTA) position. The function of an ORTA position is to:

- Assess selected research and development projects that laboratory is engaged and, in the opinion of the laboratory, may have potential commercial applications.
- Provide and disseminate information on federally owned or originated products, processes, or services having potential for application to state and local governments and to private industry.
- Cooperate with and assist the National Technical Information Service (NTIS), the Federal Laboratory Consortium (FLC), and other organizations that link federal R&D resources of that laboratory and the Federal Government as a whole to potential users in state and local governments and private industry.
- Provide technical assistance when requested by state and local government officials.
- Participate, where feasible, in regional, state, and local programs designed to stimulate technology transfer for the benefit of the region, state, or local jurisdiction in which the federal laboratory is located.
- Use Work Unit Information System (WUIS) as a tool to ensure that CRDAs, like any other work in progress, are reported in the WUIS database, according to AFI 61-203, the Work Unit Information System.

(AFMC Technology Transfer Handbook, 1995:C-2)

The Clinton administration has provided a number of policies which continues to foster technology transfer from defense to industry. The administration wants to increase industry's share of national research and development (R&D) budgets to fifty percent by 1998. Since the White House has suggested the number of joint efforts a laboratory participates in is a measure of the "validity and importance" of its work, approaching industry about shared research and development is necessary for survival. All of these actions represent a significant change in the way laboratories conduct business (Hughes, 1993:40).

Technology Transfer Issues

Technology transfer issues revolve around the mission of the federal laboratories, the creation or loss of jobs due to the new technology, and the competitiveness of the U.S.

Mission. Three options have surfaced as to how to best utilize public resources for national benefit. Option one is to abolish the federal laboratories. This is not likely since a large closure of federal laboratories could easily debilitate the nation's "brain trust" (Scott, 1993:64). The second option is to eliminate some laboratories and consolidate others. This is happening already with the federal cutbacks. The third option is to redirect the laboratories' mission. This option seems the most probable option because it allows the labs to continue on in the search for new technology and keeps jobs (Roessner, 1993:38).

Jobs. The Clinton administration has made a push to encourage the transfer of technology in an attempt to create jobs and keep the U.S. a competitive nation. Although history has shown that technology will generate more jobs than it eliminates, some people

believe that if the administration's technology transfer push is taken seriously, it will not lead to jobs, it will lead to people being out of work (Cordes, 1995:A28). But technology has always improved the standard of living of a country (Cordes, 1995:A29). According to Robert White, president of the National Academy of Engineering,

"If history is our guide, then technology will clearly produce more jobs than it will destroy. But history may not be a guide because of the enormous power of technologies today. This is an area that deserves quite a bit of research. I don't think we fully understand what is going on."

(Cordes, 1995:A28)

Research has found that in the 1980s, Fortune 500 companies cut some 3.5 million jobs, but by contrast, small businesses created 20 million jobs and this trend continues to accelerate (Bodde, 1993:278). The Small Business Innovative Research (SBIR) program contract allows small businesses to do research for the government and obtain funding in the process. The congressional findings that led to the original SBIR program concluded that technology innovation creates jobs, increases productivity, increases competition and increases economic growth (Friedman, 1994:210). Many people believe that technology will create jobs, but Mr. White has a point; further research must be done to identify if the enormous power of technology will lead to jobs as history would have us think.

Competitiveness. Another issue that accompanies the job issue is the competitiveness of the U.S. Technology innovation is a major force in international competitiveness; the cornerstone of competitiveness for the U.S. economy. In the early 1980s, erosion of U.S. competitiveness is traced to a lack of innovation and decreased emphasis on technology in corporate strategic behavior (Chakrabarti, 1994:758, 769). To help slow this erosion, Congress enacted the legislation discussed, hoping to increase the

competitiveness of the U.S. New technology is considered a critical element in improving productivity, and such improvements are, in the long run, the only way to improve the nation's competitiveness and standard of living (Carr, 1992:8). In 1994, large and small companies received several very attractive offers from foreign companies that want to work with U.S. companies. The U.S. government needs to understand that foreign interests are offering "good deals" and competing for the talents of U.S. companies (Scott, 1994:42). In a recent study, domestic firms outside the defense sector were found not tapping into defense technology in a very effective manner. Foreign firms, particularly Japanese firms, are much more aggressive in terms of building on U.S. defense technology (Chakrabarti, 1994:769). Table 1 shows what products U.S. firms have pioneered and produced first, but foreign firms now hold the current leader position.

As previously mentioned, federal laboratories are facing a changing mission, which now includes the transferring of technology to private industry. But not every laboratory is well suited to be a technology transfer partner and, moreover, technology transfer activities may even get in the way of activities such as basic research, technology development, or education (Boseman, 1991:243). Since new technology is critical to improving the nation's competitiveness, private industry needs to obtain or develop new technology in order to market it. Many commercial firms do not have the equipment the federal laboratories have to develop their own new technology. Also, there is a big difference between the laboratories and private industry: laboratories do research for research's sake, which is usually long-term, and industry does research for profits, which are usually short-term (Baron, 1990:39). This difference is evident when firms examine

defense laboratories to see what technology is available and realize a product is not sitting on a shelf ready for use. Industry often does not want to put the time and capital into performing more R&D to find an actual use for a technology, since they are oriented toward short-term success and profits.

Table 1: R&D Leaders

Nations and continents originating breakthrough R&D compared to those first commercializing products from this research and compared to those leading today's market for these products

Technology or Product	R&D Leader	First Product	Current Leader
Advanced Composite Materials	U.S.	U.S.	Japan/ U.S.
Automatic Focus Cameras	U.S.	U.S.	Japan
Automobiles	Europe	Europe	Japan
Biotechnology	U.S.	U.S.	U.S.
Commercial Jet Aircraft	Europe	U.S.	U.S.
Communications Electronics	U.S.	U.S.	U.S.
Compact Disk Players	Europe	Europe	Japan
Computer Aided Design	U.S.	U.S.	U.S.
Consumer Electronics	U.S.	U.S.	Japan
Copiers	U.S.	U.S.	Japan/ U.S.
Desktop Computers	U.S.	U.S.	Japan/ U.S.
Digital Watches	Europe	U.S.	Japan
DRAM Memory	U.S.	U.S.	Japan
Drugs and Pharmaceuticals	U.S.	U.S.	U.S.
Facsimile Machines	U.S./Europe	U.S.	Japan
Fiber Optics	U.S.	U.S.	U.S.
Flat Panel Displays	U.S.	U.S.	Japan
Fuzzy Logic	U.S.	Japan	Japan
Hand-Held Calculators	U.S.	U.S.	Japan
High Temperature Superconductors	Europe/ U.S.	Japan/ U.S.	?
Integrated Circuit Manufacturing Equipment	U.S.	U.S.	Japan/ U.S.
Integrated Circuit Test Equipment	U.S.	U.S.	Japan
Jet Engines	Europe	Europe	U.S.
Medical Imaging Technology	U.S.	U.S.	U.S.
Microprocessors	U.S.	U.S.	U.S.
Military Radars	Europe	Europe	U.S.
Notebook Computers	U.S.	U.S.	U.S.
Numerical Control Machine Tools	U.S.	U.S.	Japan
Rocket Propulsion	Europe	Europe	U.S.
Robotics	U.S.	U.S.	Japan
Semiconductor Lasers	U.S.	U.S.	Japan
Software	U.S.	U.S.	U.S.
Supercomputers	U.S.	U.S.	U.S.
Television Sets	U.S.	U.S.	Japan
Total Quality Management	Europe	U.S.	Japan
VCRs	U.S.	U.S.	Japan

(Gover, 1994: 37)

Dissemination. Disseminating technology information to industry is another issue that needs to be addressed. The legislation reviewed above has developed one method of disseminating this information. This method is through the CRDA and SBIR programs. The CRDA program puts industry and government personnel in direct contact with each other, allowing industry to develop products that "spin-off" from government's products. The SBIR program allows small businesses to receive information about what is available in the laboratory, and also allows them to receive funding from the government to do research. Although other issues exist, it is prudent to look at the technology transfer process to understand why these issues are important.

Technology Transfer Process

When first attempting to transfer technology, one will often look for a "how to" book or checklist in order to facilitate the process. The problem is that no "how to" book actually exists. Many papers and handbooks have been written describing best technology transfer practices, but these all say there is no best way to transfer technology (Souder et al, 1990: 5). Each organization must determine their own detailed process steps (AFMC Technology Transfer Handbook, 1995: D1). Two of the many models developed to aid in understanding how technology transfer works follow.

Model One. The first model is from Souder, Nachar and Padmanabhan. This model consists of four stages: Prospecting, Developing, Trial, and Adoption. Prospecting consists of research, analytical, and decision making activities aimed at screening alternative concepts or technologies and selecting the ones that fit users' requirements. Developing consists of physical and laboratory R&D activities focused on enhancing,

elaborating, embodying, and tailoring the selected technologies from prospecting to meet users' requirements. Trial tests the developed technologies. The last stage, Adoption, consists of final development, technology modification, and user implementation activities. Although one would logically follow this model in the mentioned order, this process is dynamic (Souder et al, 1990: 5-6).

Model Two. This model comes from the AFMC (Air Force Material Command) Technology Transfer Handbook. This model consists of three steps based on the systems engineering model of input, throughput, output. This model can be seen in Figure 1. Step 2 is the actual transfer process. Figure 2 shows Step 2 broken into six sub-steps that have been identified by the Air Force Technology Transition Office (TTO) to aid in developing

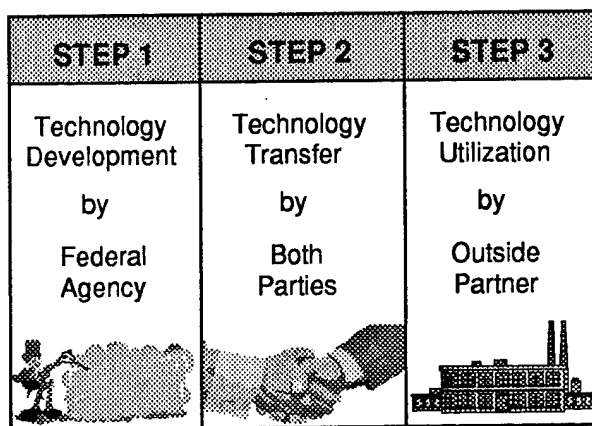


Figure 1
Transfer as the Systems Engineering Model
(AFMC Technology Transfer Handbook, 1995: D-1)

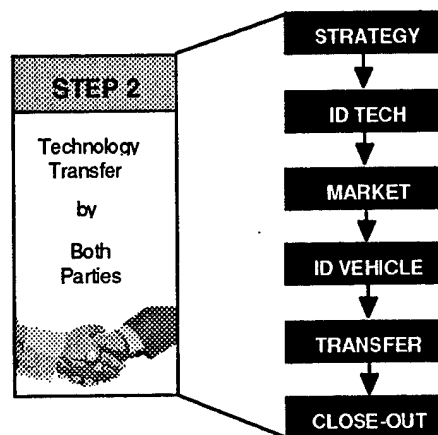


Figure 2
The Master Process
(AFMC Technology Transfer Handbook, 1995: D-2)

site-specific detailed processes. According to AFMC, three groups of personnel within the Air Force must carry out certain responsibilities across these six layers. The three

groups are: Scientists and Engineers (S&Es), Transfer Focal Point (TFP), and the Technology Transfer Office (TTO). The S&Es are the “worker bees” who develop the technology and have the responsibility to do the actual transfer of technology. The S&E’s are located at each laboratory, product center and logistic center. The TFP is a person assigned to or reports to the ORTA and has the responsibility for all six master process steps for an individual organization. The TFP is also located at each laboratory, product center, or logistic center, but are assigned to certain divisions within the organization. For example, one TFP is assigned to each directorate within WL. The TTO has the responsibility of command level requirements. Only one TTO exists and is located at headquarters AFMC, Wright Patterson AFB, OH.

Based on the master process, the S&Es identify technology, market the technology and then transfer the technology (AFMC Technology Transfer Handbook, 1995: D-2).

The TFP responsibilities are to:

- Help R&D managers identify DoD Research and Technology (R&T) efforts in a broad range of scientific disciplines and technologies.
- Permit managers to coordinate programs easily with other DoD Components and with other agencies and branches of the Federal Government to eliminate overlap of effort.
- Help individual scientists and engineers (S&Es) determine current and past efforts related to their own work.
- Enable S&Es and managers to identify persons working in technical areas of interest whom they can contact for further technical information.
- Allow S&Es to maintain current awareness through periodic reviews of pertinent work units.

- Improve the efficiency and cost-effectiveness of the defense contractor community by providing knowledge of ongoing DoD work so they can focus their R&D efforts toward national defense and military requirements.
(AFMC Technology Transfer Handbook, 1995: C-2 - C-3)

As mentioned before, the TFP has responsibility for all six master process layers which can be broken down into approximately forty process steps (Appendix A) at the local area. The TTO office concentrates on strategy, marketing technology, and post-transfer administration (AFMC Technology Transfer Handbook, 1995: D-2).

The AFMC Technology Transfer Handbook puts most of the responsibility for technology transfer on the local organizations TFP. The TFP must prepare and submit an annual business plan outlining the TFP's future plans for technology transfer with respect to present transfer activities (AFMC Technology Transfer Handbook, 1995: E-1). The TFP must determine which of their technologies are available for transfer, which have the potential for transfer, which can help both the Air Force and the outside partner, and then how to market them to achieve the anticipated transfer success (AFMC Technology Transfer Handbook, 1995: G-1). Based on the importance of technology transfer and the large number of commercial firms, this is a significant responsibility for the TFP. This burden may have been the spark for the development of third parties or brokers in the technology transfer process. Previous studies of brokers in the technology transfer process follows.

Previous Studies

The first study discussed is by Diane Palmintera entitled, "Extension Services and Intermediaries: Brokering Federal Technologies to Smaller Firms." This study, performed from 1992 to 1993, shows that extension services and intermediaries effectively assist small firms in developing relationships with federal laboratories. The study found that these intermediaries were well positioned since their agents worked directly with small firms, helping them resolve technical and business issues. They were able to segregate technical problems, understand needs and apply a multitude of resources to the cause.

This study was driven by the following basic assumptions:

- Technology transfer should be demand driven; it should focus on the needs of the user community.
- Small and medium-size firms (particularly in traditional industries) that could benefit from federal-laboratory technology are difficult to identify and serve.
- In order to effectively tap into the user community, industrial extension services and similar organizations that already have ties to the user community are in a prime position to identify and interpret small-industry needs and to provide linkages to federal laboratories.
- Small and medium-sized firms often have multiple needs requiring technology, management, and other resources of varying types and levels of sophistication.

This study was an 18-month project that involved the Southeastern Pennsylvania and Iowa areas. The extension services in Southeastern Pennsylvania worked with the Naval Air Warfare Center and the services in Iowa worked with Ames Laboratory, a federally funded research and development center. In meetings with the extension services and the laboratories, the laboratories identified an area of concern that showed the need for the extension service. Laboratories are concerned that the firms are not specifically

and narrowly defining their problems. These small businesses look at a problem as being technical when in fact it is a management or non-technical problem. The laboratories are able to respond more quickly if the problem is already sorted and defined before it reaches them. This is where the technology transfer broker steps in. The roles of the extension services can be broken into two groups: services to the private firm and services to the laboratories. This study determined that the roles of the extension services are as follows:

Services to the private firm:

- Assist firms in targeting and defining a technology problem or interest; most importantly, separating technology from management, organization, and other issues.
- Identify a specific federal laboratory with technologies or other resources to help find solutions to a firm's technology problem or explore new opportunities.
- Provide follow-up with firms to insure that the appropriate laboratory contact has been reached, and, if necessary, redirecting contacts.
- Assess a firm's needs for business services that support and complement technology-transfer activities.
- Coordinate local resources--both technology-related and business-related--that can be used by the firm in conjunction with federal-laboratory resources.

Services to the laboratories:

- Help the firms understand and negotiate the formal and informal working relationships with the laboratory.
- Make initial contact with the federal laboratory on the firm's behalf, and help the firm's representative establish a personal relationship with the laboratory's representative.
- Disseminate information about the federal-laboratory system, its resources, and means of access.

Another observation from this study was that firms constantly needed follow-up by the extension service or they would “let the ball drop.” The study found that most small and medium sized firms did not like to work with other companies and so they needed constant prodding and hand-holding in the early stages. Federal laboratories do not have time for this, making the extension service even more of a viable service to both the federal laboratories and the firms. This article made two types of recommendations, one to the federal government and laboratories and one to intermediary organizations.

Recommendations for the federal government:

- Congress and the federal government should re-examine the federal-laboratory structure to identify and resolve redundancy and gaps in the system.
- The federal government should fund intermediary organizations to broker small-firm interaction with federal laboratories.
- The government should mandate that federal-laboratory ORTAs have at least one full-time member staff who is responsible solely for liaison with non-federal parties.
- The federal government should fully fund FLC regional representatives.
- There should be more incentives for federal laboratories to work with small industry.
- Federal laboratories should be more proactive in pursuing relationships with the business community, particularly small and medium-size firms.
- A “mini-CRDA” and/or other less formal mechanisms should be developed to work with small business and industry.

Recommendations for intermediary-organizations:

- Relations with federal laboratories should be viewed by intermediaries and individual firms as a long-term development process rather than a short-term fix-it.
- Firms and intermediaries must be persistent when dealing with federal laboratories.

- Federal laboratories can respond more quickly and appropriately if the firm or intermediary organization correctly identifies a specific technology problem.
- Intermediaries should apply multiple technical and business resources to solve technology problems.
- Intermediary organizations must be proactive and provide continuous follow-up when dealing with small companies in the technology-transfer process.
- The intermediary organization should act as an advocate on behalf of the small firm to ensure that federal laboratories respond appropriately to their client's needs.

This study emphasizes the services intermediaries give to firms in the technology transfer process, further stressing the need for this research which will emphasize the service intermediaries give to laboratories.

Another article written on this subject is by John Masten and Bruce Hartmann entitled "The Utilization of Technology Assistance by Small Manufacturers" (Masten and Hartmann, 1993: 84-90). This paper looked into the extent that small manufacturers in Nashville, Tennessee have installed the latest industry technology and have external public and private sources of technical information. The authors claim that in order for a small firm to remain competitive, the firm must acquire technological improvements from external sources. Therefore, an effective technology transfer network could be an important outside source for this technological information. The authors' study assessed the need for technology and the effectiveness of the technology transfer network in Tennessee. A 26-question survey was used to obtain the necessary information. The conclusion was made that there was a need for technological assistance by small Nashville manufacturers and also that the tested firms were not effectively using outside consultants

to help solve their technological problems. Again, this study concentrated on the effect third parties have on small firms, not effect of third parties on the laboratory.

A master's thesis written by Marissa Salvador entitled "Assisting Defense Conversion Technology Transfer Efforts: A Case Study of Ohio's Miami Valley" describes the use of third parties in Ohio to promote its economic growth. Salvador's research objective was to investigate and describe how Miami Valley intermediary technology organizations assist and facilitate the technology transfer defense conversion effort to help promote economic growth and development in the local area (Salvador, 1995:6). The investigative questions she examined were:

1. What role do these intermediary organizations play in the Miami Valley's defense conversion process?
2. What mechanisms/methods/techniques are used to facilitate and encourage the area's technology transfer efforts?
3. How do the various organizations interact with one another to achieve economic growth and development in the Miami Valley area?

(Salvador, 1995:6)

Salvador explained the roles of the three organizations she studied, finding that the organizations were typically focused in particular market niches. She also found that the overall mission of the organizations studied could result in the overlapping of services, especially in the materials and manufacturing technology areas (Salvador, 1995:64). The main mechanisms used by these intermediaries to accomplish their mission were CRDAs, loans, and consortia (Salvador, 1995:65). She also found that a strong network and cooperative relationship existed among the different intermediary organizations (Salvador, 1995:66). Salvador found that by leveraging each others resources and funds, industries

and individual companies can make significant strides forward that are beneficial for themselves and the economy of the United States (Salvador, 1995:67).

Salvador made three recommendations for further research based on her study. These recommendations are: investigate and determine how other states and regions are transferring technology to their region; evaluate the utility of these intermediary organizations to determine what role they should play in the transfer of technology and how they should be accomplishing it; and examine the return on investment that is received from the funds that are provided from the federal government and the state to these intermediary organizations. The second research recommendation, evaluate the utility of these intermediary organizations, will be addressed by this research effort with a focused look at the utility of these third parties to the government.

Conclusion

Technology transfer is an area of great concern and controversy among people in labs, industry and Congress. This concern and controversy has initiated many studies on different facets of technology transfer, but the use of intermediary companies, third parties, or brokers to promote technology transfer has just started to be investigated. This thesis investigates the intermediary role of Wright Technical Network in the technology transfer process and their value to the Government. As can be seen by the literature reviewed, no research has been done with this focus in mind. Chapter III will discuss the method used to accomplish the purpose of this thesis.

III. Methodology

Introduction

This chapter discusses the methodology used to collect the data required to address the research objectives. The case study approach is used to obtain information on how current third parties facilitate technology transfer. The population studied is discussed along with the research instrument used and the data analysis process.

Case Study Background

This research effort is aimed at finding out how Wright Technology Network (WTN), a technology transfer third party, aids the transfer of technology from federal laboratories, specifically Wright Laboratory located at Wright Patterson Air Force Base, Ohio, to commercial companies and then to determine what value is added to the government by using this third party. The approach chosen to accomplish this research effort is the case study method.

According to Robert K. Yin, three conditions can help determine the appropriate research strategy for one's research:

1. the type of research question posed;
 2. the extent of control an investigator has over actual behavioral events; and
 3. the degree of focus on contemporary events as opposed to historical events.
- (Yin, 1989:16)

As previously mentioned, the research question being asked is "How do third parties or brokers facilitate and promote technology transfer from Government

laboratories to commercial companies and why should they be used?” This main research question is in the form of both “how” and “why”, which is the first requirement for using a case study. Reviewing the next condition shows that this investigator has no control over actual behavioral events, therefore meeting the second requirement for using a case study. And since this research effort does not focus on historical events, but rather contemporary ones, the third condition of using a case study is met (Yin, 1989: 17).

Yin also states that the case study is used in many settings including:

1. Policy, political science, and public administration research;
2. Community psychology and sociology;
3. Organizational and management studies, and
4. City and regional planning research, such as studies of plans, neighborhoods, or public agencies.

(Yin, 1989:13)

This research effort can be included in all four of the settings mentioned, adding to the value of using a case study method.

Yin describes four different applications of the case study, the fourth being that a case study is used to explore those situations in which the intervention being evaluated has no clear, single set of outcomes (Yin, 1989: 25). This research project falls into this realm and is exploratory in nature. According to Cooper and Emory, exploratory studies are particularly useful when the researcher lacks a clear idea of the problems that will be uncovered during the course of the study (Cooper and Emory, 1995: 117). The areas of investigation may be so new or so vague that the researcher needs to perform an exploration just to learn something about the problem (Cooper and Emory, 1995: 118).

The emergence of technology transfer brokers is relatively recent. Therefore, the nature of this research objective clearly justifies the use of the exploratory study as described by Cooper and Emory.

One of the recognized drawbacks of case studies is the problem of generalization. With a typical sample size of one, case studies provide no statistical basis to generalize the research results of a single case as being representative of a wider population (Bryman, 1989:172). Although a limitation, case studies can be used effectively in appropriate situations. They are often useful for providing an understanding of areas of organizational functioning that are not well documented, as well as exploring areas to achieve new insights that are useful for building theory (Bryman, 1989:173-174). Additionally, the qualitative data obtained in most case studies has been shown to be more attractive to the manager than the abstract variables and relationships that often characterize qualitative research (Bryman, 1989:173,178).

Population

Although the population of third parties is increasing in the technology transfer arena, one organization has been chosen for this research effort. This organization is Wright Technology Network (WTN).

WTN, formerly known as the Ohio Advanced Technology Center (OATC), was chartered in 1989 to facilitate technology transfer out of the Air Force (AF) Laboratories and Centers. The concept was for the AF (Wright Laboratory) to continue with a range of technology transfer activity such as SBIR, technical paper presentations, etc. and a not-

for-profit corporation be established to work with the Air Force and with commercial companies to match technology with industry needs. That not-for-profit corporation would have the flexibility to work in the AF and in the private sector since the State of Ohio and the United States Air Force provides its primary funding. In 1994, OATC changed their name to WTN to reflect their expanding scope from a single state to a multi-state region, allowing more companies to benefit from the wealth of technology available (Wright Technology Network Overview, undated: 1). The study of this organization provides a single picture of the process used to transfer technology.

Research Instrument

The collection of data was accomplished primarily through personal interviews and through analysis of organizational documents and brochures. The personal interview was selected because it allows for the gathering of more detailed and specific information. According to Cooper and Emory, personal interviews allow the interviewer to probe and gather supplemental information (Cooper and Emory, 1995: 271). Focused interviews were conducted in an unstructured fashion, utilizing open-ended questions. A funnel approach, moving from more structured questions to unstructured questions, was used to guide the discussion, as well as limit its scope. In order to fulfill the research objective, most of the questions are open-ended or unstructured, thereby encouraging the respondent to talk freely about the topic and give specific explanations and examples (Cooper and Emory, 1995: 299). By utilizing this interviewing technique, the interviewer had the

opportunity to explore various aspects of the topic and had the flexibility to probe deeper into areas deemed necessary.

The researcher conducted interviews with both WTN and Wright Laboratory (WL) personnel. Interviews with WTN management identified the overall mission and goal of the organization. WTN technical specialists were interviewed to identify how they interact with the employees at WL and to determine their area of expertise relative to the area of expertise currently at WL. WTN and WL administrative personnel were not interviewed due to the focus of this research effort. Interviews with WL management personnel allowed for a comparison of the goals and mission between WL and WTN. Interviews with WL scientists and engineers allowed for a comparison between the technical expertise found at both organizations. Interviews were conducted with individual personnel at each organization's location. Individuals being interviewed were contacted first by telephone to arrange for the interview time. The questions asked were faxed to them, familiarizing them with the areas of interest that were addressed during the interview. This allowed the respondents to comprehend the overall direction of the interview in advance and prepare any information they desired to have available for the actual interview.

Data Analysis

The analysis of the data was performed by examining the data collected and comparing, contrasting, and integrating the data in order for the researcher to infer general collective findings. A limitation of this qualitative data is that the above mentioned

methods of analysis are frequently unclear (Schmitt and Klimosky, 1991:152). To overcome this disadvantage, specific efforts were made to accurately organize, integrate, and summarize the data so that the analysis directly supports the thesis research objectives.

The analysis consists of several comparative components. First, the WTN transfer program approaches and objectives are compared to the Air Force Material Command Technology Transfer Handbook method. The forty sub-steps shown in appendix A were used as the frame work to identify the questions to ask WTN and WL. These questions are found in appendix B. The questions are broken into two sections, one for each organization being interviewed. Although this research is centered on determining the value of third parties to the government, each organization is different, requiring the general question to be tailored for each organization. Each section is further broken down to represent the management perspective compared to the technical perspective. The following outlines what information this researcher expects from the different groups of questions:

WTN Management and Points of Contact

- Introductory questions are expected to show what expertise and qualifications WTN management and points of contacts have that WL may not.
- The questions in the “strategy” section are expected to show the difference in strategy between WTN and WL. This should identify if one organization influences the other’s strategy and should determine the interface between WTN and WL personnel.
- The questions in the “identify technology” section are expected to determine the technology identification process used by WTN and at what level this determination takes place. Since this is one requirement for the scientists and engineers who work in the laboratory, these questions are important in identifying if WTN is accomplishing this requirement for the laboratory and if so, how well. The last question in this section is used to determine how mature the technology is that

WTN works with compared to how mature the technology would be if WTN was not involved.

- The questions in the “marketing” section are expected to help determine how WTN markets the abilities of WL. This should show the benefit of using WTN, if there are benefits. The last question is intended to give insight into how WTN goes about marketing WL technology. Does WTN rely on market circumstances to dictate what technology they find and transfer or do they push found technology to firms that may need it soon?
- The questions in the “identify vehicle” section are expected to determine if WTN uses mechanisms to transfer technology other than what would be used by WL and who chooses the mechanisms to use. Question 19 was used by Brett Smith in his masters thesis, and is a list of the most commonly used mechanisms available (Smith, 1995).
- The questions in the “transfer” section center on the actual transfer of technology. These questions are used to identify the extent WTN is involved in the actual transfer. These questions should help determine how much of the process is done by WTN compared to WL and how well they do. This will be used extensively in the determination of the value of WTN to WL.
- The questions in the “post-transfer” section are also important in helping to determine the value of WTN. If WTN is involved in the post-transfer administration then this will determine to what extent they are involved and how this benefits WL.
- The last question is used to identify other services WTN performs that may not have been identified previously.

WL Management, Transfer Focal Point, and Scientist and Engineers

- Introductory questions are used to determine background to allow comparison of the expertise and qualifications of WTN personnel to WL personnel.
- The strategy section questions are used to determine if the strategy developed by WTN meshes with the strategy developed by the Air Force and to determine if WTN follows this strategy.
- The identify technology section questions are used to determine how well WTN is at identifying technology developed in the labs and how well they match that technology with commercial firms.

- The marketing section questions are used to determine how well WTN markets WL's resources compared to how well WL would be able to accomplish this themselves.
- The identify vehicle section questions are used to identify how well WTN determines vehicles to accomplish the technology transfer compared to how well WL would be able to do it themselves.
- The transfer section questions will determine how much of the actual transfer process is accomplished by WTN compared to how much is done by WL.
- The post-transfer administration section questions are used to determine how well WTN accomplishes this requirement. If WL does this instead, the questions will determine why WTN does not accomplish this requirement.

These questions are expected to identify if WTN's program approach and objectives are the same or different to the method outlined in the AFMC Technology Transfer Handbook. The focus of the analysis is then narrowed by examining the qualitative data obtained from a WTN point of contact (technical specialist) assigned to a CRDA. The discussion of the data was expected to provide a detailed exploration of the processes and mechanisms used, and identify the similarities, differences, contributing factors and underlying trends among the specific transfer cases. Finally, the data obtained for each point of contact is compared directly to the transfer process described in the literature review. This allows a determination of differences and similarities of the WTN transfer efforts with the established and documented aspects of technology transfer according to Air Force Material Command. The questions asked, found in Appendix B, are further broken down by to whom they will be asked and what step in the AFMC technology transfer model they come from.

The analysis provides a description of the organizations' integrated and collective efforts toward accomplishing the overall goal of promoting technology transfer and the

economic growth in their local area. Exploration of the specific transfer cases is used to identify the specifics of transfer initiation, the process used, and the existence of key elements and techniques. The analysis determines how well these transfer cases support the WTN mission, as well as the concepts identified in the literature review.

Conclusion

This chapter presented the case study background, population, research instrument, and the data analysis technique. The method of collecting qualitative data is through interviews and documentation review and the data is analyzed through a construction of a case study. Chapter IV presents the results of the data collection effort and Chapter V presents the general findings of the study, the conclusions made, managerial implications, and suggests areas for further research.

IV. Results and Analysis

Introduction

This chapter will discuss what was found during the personal interviews outlined in Chapter III. First, the technology transfer process steps according to the AFMC Technology Transfer Handbook is reviewed, followed by how these steps are performed at Wright Laboratories with the assistance of Wright Technology Network. After this comparison, an analysis of the research questions is presented.

Technology Transfer: AFMC Direction

Figure 2 (Chapter 2), outlines the AFMC master process of technology transfer.

The process is comprised of six steps. These steps are shown again in Figure 3,

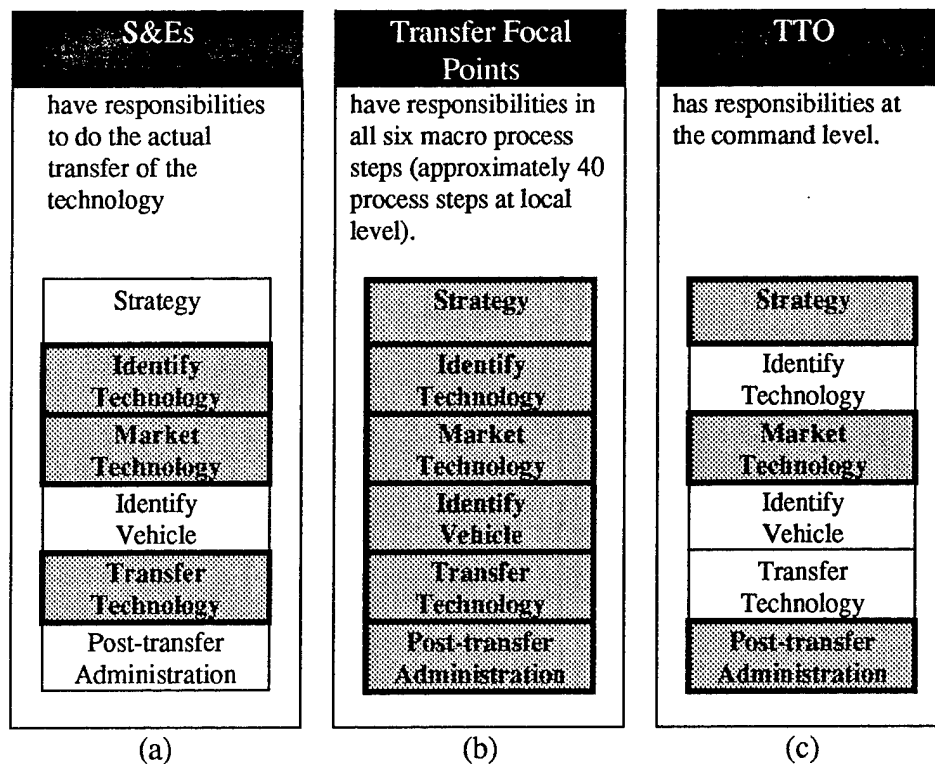


Figure 3
Who Works the Various Steps
(AFMC Technology Transfer Handbook, 1995: D-2)

highlighting personnel who participate in each step. Figure 3b shows that the transfer focal points have responsibility in all six steps and Figures 3a and 3c show the S&Es overlapping with the TTO in the marketing of technology. This section will identify each step, who is responsible for it and how it is to be accomplished according to AFMC guidance. Within the breakdown of each step, the sub-steps located in Appendix B should be referred to in understanding what is required within each step.

Strategy. Strategy is the first step in technology transfer and the responsibility of the TTO and the laboratory's transfer focal points. Strategy can have two meanings. The first meaning refers to the overall strategy that governs the technology transfer mission of Wright Laboratory. The second meaning refers to the strategy developed for each individual transfer effort within each directorate. Although the AFMC Technology Transfer Handbook does not elaborate on the second meaning of strategy, the need for this type of strategy, even if informal, is evident. The overall strategy is developed when each laboratory and center establishes an annual business plan that describes its local near- and long-term plans for achieving its technology transfer goals and objectives (AFMC Technology Transfer Handbook, 1995: D-3). This business plan is then aggregated into a command transfer plan (AFMC Technology Transfer Handbook, 1995: E-1). The plan includes the budgetary requirements and justification for the transfer program. Since there is no program element for transfer activities, all funding requirements must come from the organization's internal funds. Also, part of the strategy includes assessing technologies with prior requests for technology and assistance and, based on return on investment, determination of how the funds should be allocated (Appendix B). Another aspect of the strategy for each directorate is the establishment of transfer thrusts (Appendix B). Core

competencies have been identified to include the following transfer thrusts: automotive; general aviation; medical; law enforcement; agriculture; and environment. Each directorate should choose among these core competencies to determine what their transfer thrusts will be when developing their strategy.

Technology Identification. The next step in technology transfer is the identification of technology. Figure 3 shows this to be the responsibility of focal points and S&Es. The purpose of this step is to ascertain which technologies are available for transfer and which technologies have a greater potential for successful transfer. Once the organization's technologies (which are available for transfer) have been identified, then it is necessary to evaluate these technologies for their transfer potential (Appendix B). Transfer potential includes an analysis of the technology's commercialization prospect.

Most technologies have some commercial potential, but not all the technologies can readily be commercialized (AFMC Technology Transfer Handbook, 1995: D-4). A database is to be used to store the list of potential technologies (Appendix B). This database is to allow all focal points easy and quick access to technologies that may help a potential outside partner and also allow the Air Force's TECH CONNECT office to search for technologies to match customers' needs (AFMC Technology Transfer Handbook, 1995: D-5). The TECH CONNECT office is located within the TTO to answer questions about technology available within any AFMC laboratory.

Marketing. All three groups are involved in this step. The AFMC Technology Transfer Handbook has a short explanation describing marketing and how it is to be done.

The purpose of the marketing steps (Appendix B) is to promote those technologies with high commercial potential. These steps also help coordinate and

synergistically help the laboratories and centers pool their marketing through the Command Transfer Team.

The marketing strategy has its beginnings in the organization's transfer business plan. It helps the focal point focus limited resources onto those efforts that will have the higher payoffs. Strategies include, but are not limited to, placing ads in technical magazines, printing brochures, hosting technical symposia, and displaying technology transfer information in convention exhibit halls.

Marketing may be highly focused on a specific technology or it may be a broad brush stroke in order to develop interest in the organization's technologies from multiple sources. The basic idea is to create demand for those technologies among your target audience.

The TTO often coordinates displays and magazine ads for the command. These advertisements provide an excellent opportunity for increasing a technology's exposure, which otherwise might go unnoticed.

(AFMC Technology Transfer Handbook, 1995: D-5)

This shows that although the TTO has some responsibility for marketing, it is purely as a facilitator and provides help to each focal point. The TTO does not perform this task itself.

Referring the Appendix B, one of the sub-steps under marketing is to create technology demand. This is a crucial step to marketing and why marketing is so important. It lets industry know what is needed and available and if marketed correctly will create a sense of need by industry, therefore creating a demand for the technology.

Vehicle Identification. The fourth step is Vehicle Identification. This vehicle is the mechanism used to best transfer technology to a commercial firm. Appendix C lists the most commonly used mechanisms, their descriptions and their features/characteristics. The responsibility of identifying the transfer vehicle solely resides with the local focal point. The list identified in Appendix C is found in the AFMC Technology Transfer Handbook and is there to aid the focal point in determining which vehicle best fits the transfer case. Initial negotiations between the government and commercial firm are

accomplished to agree on which mechanism to use (Appendix B). Once the whole process has been accomplished the transfer is ready to become final.

Transfer. The fifth step is the actual transfer which identifies both the focal point and the S&E as responsible. The S&E is responsible, according to the terms of the transfer vehicle, to perform the actual transfer of technology since he/she is most knowledgeable of the technology. The focal point is responsible for monitoring the transfer and verifying that both parties are living up to their end of the contract and that the effort meets stated objectives and results (AFMC Technology Transfer Handbook, 1996: D-7). Appendix B shows that some of the transfer process steps are the authorization of the transfer and the actual transfer of the technology. The transfer is authorized by the commander of WL, after the base legal office has approved it and the firm receiving the technology is in agreement. The actual transfer is between the firm and the S&E, with the focal point monitoring the process.

Post-Transfer Administration. The last step is the post-transfer administration. The following is what the AFMC Technology Transfer Handbook states about this step:

The purpose of the post-transfer administration steps: account for all the transfer activities, advertise the successful transfer, and reward and recognize the Air Force participants. These steps track success against the goals set in the investment strategy and the business plan. They provide accountability and the feedback of metrics as well as lessons learned and public relations.

Each focal point needs to track the transfer process at his or her organization. This tracking includes local metrics (core and tool) for managing the process. Both the external and internal outcomes are documented on the various forms discussed in the previous paragraphs of this section. Together with the local metrics, the focal point will be able to pinpoint successful activities that need to be continued and activities that need to be changed or eliminated. This information will help the focal point develop future transfer strategies to maximize meeting organizational goals.

The focal point also should be working with the local comptroller office and the organizational commander for distribution and expenditure of the collected revenues. Many of these revenues can be used to help fund the focal point office and activities.

The focal point has the responsibility to ensure those organizational people, involved in making transfer a success, are adequately recognized for their efforts. The command encourages each focal point to establish a local awards program to supplement the command awards program.

(AFMC Technology Transfer Handbook, 1995: D-8)

Guidance on accomplishing technology transfer has been outlined according to the AFMC Technology Transfer Handbook. This book has been issued to all AFMC offices that are involved in any way with technology transfer. This book serves as one method of training S&Es and focal points about technology transfer and it also outlines another method in place to train people. There is also a ninety minute class designed to teach students the fundamentals of technology transfer. This class is designed to be broadcasted over the Air Force Institute of Technology's Distance Learning Center satellite network (AFMC Technology Transfer Handbook, 1995: F-1). This allows personnel to go to any education office worldwide and view and interact with the class. The technology transfer training program is aimed at all Air Force S&Es to provide them with an overview of the technology transfer process, emphasizing real-world technology transfer examples, which they can apply to their own areas of technology expertise (AFMC Technology Transfer Handbook, 1995: F-1).

Technology Transfer at Wright Laboratory

ORTA/Focal Point Perspective. The full transcripts of the interviews with the ORTA and focal point are found on pages 104 - 111. Based on the interviews performed, the roles and mission of the ORTA/Focal Points are outlined and then how WTN contributes in each of the major technology transfer process steps.

Strategy is the first area of responsibility for the focal point. Although strategy is the first step in the list, these steps are not necessarily accomplished in order. Strategy for a technology transfer effort could be accomplished after technology has been identified, while the marketing is being done, and after a transfer vehicle has been selected.

The role the ORTA plays in developing a directorate's strategy is one of overall strategy creation. The ORTA starts with a strategy Integrated Product Team (IPT) to develop an overall strategy for WL. The strategy developed by the IPT states that WL will do the following:

- Sustain World Class Science and Technology Capability
- Promote and Engage in Cooperative Ventures with Industry and Academia
- Take Advantage of Industry Technology ("Spin-On")
- Assist U.S. Industrial Manufacturing Base to Achieve and Sustain World Market Leadership
- Sustain the Transition of Technology

The role the focal points play in strategy is two-fold. First, each directorate's strategy is developed with input from the focal point. This strategy is suppose to be based on the WL strategy, although the strategy of pushing as much military technology to commercial industries is not enforced and each directorate has continued to do "business as usual" (Appendix D: Page 109). This lack of complete compliance occurs because the

directorates do not have the resources (funds and manpower) to dedicate towards a focused technology transfer effort. Second, since each transfer effort is unique, a separate strategy for each transfer is required. This is written by the focal point, usually after the technology and potential acquiring firm has been identified.

Another role that each focal point has is the creation of a business plan. Each directorate prioritizes and strategizes their own plan for allocating funds for technology transfer. Some of these funds are used to pay for the Intermediary Partnership contract WL and the State of Ohio have with WTN. Although each directorate is directly funding the WTN contract, each strategy developed for a particular technology transfer effort does not automatically involve WTN. When a strategy for the transfer of a technology is written, WTN will be included only when they actually identify the technology that has the potential to be commercialized or identify a firm requiring technology developed by the laboratory. This research has found that focal points do not readily go to WTN for assistance in developing strategies. WTN's involvement in the process seems to be self initiated.

WTN has very little input into the development of any of the different types of strategies. WTN is not part of the IPT and will only advise the transfer focal point on what may work best for a particular effort when developing the actual transfer strategy for a specific technology.

The next step is technology identification. The ORTA does not play much of a role in this step. The role of the focal point is to identify what technology has the potential for commercialization. This role includes maintaining a database in order to

allow for a quick and informative response to a need. Entering information into a database is not currently being done. According to one ORTA team member interviewed, the database requirement is a bad idea. The division chief for XPT believes that this duty belongs to NTTC (National Technology Transfer Center), although NTTC's mission has changed to only maintaining a database of technology developed by NASA. But even before a database is constructed, the technology must be identified.

The problem the focal points face when attempting to identify a technology that has commercialization potential is that they do not know what industry needs or would be interested in. According to the focal point, they usually generalize a technology to an industrial field. Therefore, the focal points do not identify technology that may have commercialization potential. The focal point interviewed relies on firms coming to WL requesting technology and on WTN to identify companies needing a certain technology available in the laboratory.

WTN contributes to the technology identification step in many ways. One way, according to a WTN technical specialist, is by requesting a list of all technology being worked on or already patented in each directorate and then performing a market analysis of a technology's commercialization potential. This technical specialist has also noticed more and more S&E's coming forth with technology they think has the potential to be commercialized. Another way is the determining of exactly what kind of technology a company needs. WTN has been very successful in determining what a company needs, whether it is technology developed in the laboratory or simply a non-technology issue such as management or organization. WTN is able to "weed out" companies who do not

require technology that WL has and therefore, allows WL to concentrate on other fruitful technology transfer efforts. Still another way is to call companies to ask what they may need. According to a technical specialist for WTN, they try to keep an eye on industry to see changes so that they can possibly identify firms that can use a technology that has been identified in the laboratory.

The third step is the marketing of technology. The role of the ORTA and focal point is to market technologies developed in the laboratory and also the laboratory's capabilities. The problem identified by WL management and the focal point is that WL does not have the resources available to actively market technologies. WL management feels there is no real focus in the marketing arena right now and unless there is a culture shift in the Air Force and money is provided to the laboratory for marketing, WTN and other third parties will have to be the marketing tool used. Currently, the ORTA markets to general industrial fields by advertising in magazines and newspapers, sending out brochures, making a monthly video of four different technologies available in the laboratory, and word of mouth. WL also has a 800 phone number, encouraging companies to call and request more information on technology available in a certain industry. The focal point is aware of the different mechanisms used by the ORTA to advertise, but is not very involved in the process. The focal point believes that WTN does a good job at marketing WL's capabilities and technologies and is helping in creating an industry pull of technology from the laboratory.

WTN plays a very large part in supporting the ORTA's marketing efforts. WTN has hired a person strictly for the marketing of WL and WTN, and every technical

specialist calls companies trying to inform them of WTN and WL's capabilities in order to identify companies who require technology. According to one WL technical specialist, WL is not able to approach industry, but WTN can. Both WTN and WL management's feel that WTN is more flexible than WL in how they are able to conduct marketing.

The next area for the ORTA and focal point is vehicle identification. This step is being accomplished very well by both the ORTA and focal points. The single most used vehicle to transfer technology is the CRDA. According to WTN, there have been 104 signed CRDAs to date at WL, 35 based on WTN's efforts. Currently there are 67 active CRDAs with 27 stemming from WTN's efforts. This shows the wide spread use of the CRDA, but WL management feels the CRDA is too lengthy for some transfer requirements. The laboratory is currently striving to develop a CRDA that lasts about six months instead of eighteen to twenty-four months. A shorter CRDA would allow more focused transfer efforts. Also, companies who do not want a long term commitment will be able to obtain the benefit of technology and/or equipment found in the laboratory. The other common vehicles used are license agreements, test agreements and technical assistance.

WTN contributes to this step by giving advise on what they think may work the best, but the final decision is left up to the Air Force and the firm involved in the transfer effort. If a CRDA is to be used, WTN may help the firm obtain funding or other required service to make the CRDA a success.

The next step is the actual transfer. The ORTA and focal point are not involved much in this step. The ORTA and focal point mainly monitor the process from this point

and leave the day-to-day workings of the transfer effort up to the S&E and the firm.

WTN does not contribute to the ORTA or focal points roles in this step.

The final step for the ORTA and focal point is the post-transfer administration. This step includes monitoring the outcome of technology once it has been transferred and performing evaluations on transfer activities in order to maintain continuous quality improvement. According to WL management, this is a weak area. Although the ORTA does not have the funding or manpower to accomplish this task, they still feel that this type of evaluation is necessary. According to WL management, "If we have thirty CRDAs and three result into something really significant, we need to look at the others and determine what went wrong; was it not commercially ready, outdated, not relevant to the commercial world, etc. (Appendix D: page 104)." The focal point knows what went good and bad with each transfer effort, but does not document it.

Other roles of the ORTA and focal point are to award and recognize transfer efforts. This is done on a laboratory level and some on a directorate level, although some do not feel this to be very important or necessary. WL management feels that the awards should be monitored and issued at the command level. The awards would have more meaning and be more significant coming from AFMC.

WTN does not officially contribute to this step by performing evaluations on the outcome of a transfer effort, although WL management feels that this should be one of WTN's jobs. WTN currently has the ability and expertise to accomplish this task better than the Air Force. WTN monitors its member firms to determine the outcome of technology that has been transferred, but does not submit its conclusions to the Air Force.

S&E Perspective. The full transcript of the interview with the S&E is found on pages 111 - 115. The S&E only has responsibility for three steps in the master transfer process. The first step is technology identification. The role of the S&E in this step is to determine if the technology currently working on is commercializable or has a possible use by industry. The S&E does not focus on this role. The S&E interviewed stated that most of his effort is in the technology development itself and is not aware of what industry is looking for. Also, he does not know how to convert technology to a commercial need.

According to the S&E, industry experience is also found in Air Force Reservists who are required to spend two weeks a year in the laboratory. During the interview with the S&E, he identified Reservists who spent two weeks a year in the laboratory were able to identify technology that could be used by firms they worked with and for. This arrangement worked very well since the Reservists had experience in both industry and the military. This type of experience mix is what WTN is trying to bring to Wright Laboratory. Currently, of employees at WTN, 75% of them have prior military or military laboratory experience and 25% have industry experience or industry training (Appendix D: page 77).

One WTN technical specialist stated that WTN tries to tailor their technology identification efforts (technology required by industry) to meet the fields of interest of the S&Es. The specialist stated that the S&Es are more interested in technology transfer and it is easier for the S&Es to work on technology industry wants if it is in their general line of work.

The second step the S&E is involved in is marketing. According to the S&E interviewed, his role in the marketing of technology is participation in "industry days", conferences, symposiums, and technical papers. Other methods used to market WL capabilities and technology developed is up to the focal point and ORTA.

WTN's role in contributing to the marketing of technology from the S&E perspective is very minimal. The S&E is not aware of pull requirements that WTN may be finding. The S&E stated that if he knew of pull requirements then he could tailor his research programs to meet those areas.

Another concern of the S&E in marketing is the feeling that the marketing efforts are not reaching all interested industries. For example: During the National AeroSpace Plane (NASP) effort, many new and remarkable technologies were developed, some technologies being in fluid dynamics. The S&E's tried to promote this technology to potential markets they thought could use it. However, during a symposium on fluid dynamics, an eye surgeon was found to be very interested in this technology. Eye surgery was a market not conceived of needing or using this type of technology. This example may explain why many S&Es do not know if the marketing efforts performed, especially by the Air Force, are reaching all the possible companies that may have an interest in the technology.

The last step the S&E is involved in is the actual transfer of the technology. The S&E has most of the responsibility for the success of this step. The first role of the S&E is to determine how to fulfill the need identified by industry. Once a way has been

identified, industry then determines if this method will fit the firm financially, maintainably, and producably.

The next role the S&E has is to negotiate the terms of the transfer transaction. This is done with the help of the legal office, but is ultimately up to the S&E to determine his terms for the transfer of the technology he developed.

One more role in this step for the S&E is to determine if he/she is to become involved in a transfer effort. An informal transfer effort (such as technical assistance) may take an hour, three hours or possibly a week or two. The problem identified by the S&E is they do not know if there is a threshold that once passed the effort needs to be a formal effort. If the effort is formal, permission from the directorate is required before allocating time to this project. Responsibility for both the formal and informal transfer efforts falls on the S&E.

The contributions of WTN to the S&E in the technology transfer step has been immeasurable. The S&E interviewed has had no training or experience with using CRDAs or any of the formal technology transfer mechanisms. According to the S&E, he had developed a technology during his time with the NASP program that was identified as a technology that a company wanted. In an attempt to transfer the technology using a CRDA, the company did not have the funds required. The S&E stated that none of the Air Force organizations knew of any way other than a CRDA to transfer this technology, but without funding, this effort would not work. This is where WTN assisted. Through WTN's contacts they were able to find a company to finance the transfer effort and make the CRDA a success. WTN also maintained the paper work, allowing the S&E to focus

on the actual transfer effort. The S&E was very pleased with how the transfer worked out.

Based on this example and others stated during interviews, WTN has been found to facilitate the success of WL's technology transfers through their ties with industry. They also facilitate the effort by doing the paperwork and monitoring the progress of both the government and the firm. Another noticeable benefit of WTN is that they help the laboratory understand and negotiate the formal and informal working relationship with the firm who is acquiring the technology. WTN does not involve themselves in the actual negotiations, but they may advise a company on what has worked in the past on similar efforts or advise the Air Force on what they feel is best for both the government and industry. WTN has also been found following up with firms to insure the appropriate laboratory contact had been reached and that the transfer effort is taking place. This follow-up shows professional concern for making every transfer effort a success.

WTNs Perspective. Full transcripts of interviews with WTN are found on pages 75 - 94. WTN has many capabilities based on their experience. Their mix of ex-military and industry personnel gives them an advantage over the Air Force. WTNs' military experience ranges from twenty to thirty years per person of working in laboratories and the Air Force. The industry experience ranges from six years to one person being a former president of a fortune 500 company. Those hired at WTN have at least bachelor degrees relevant to their job, making WTN seem to have the necessary qualifications and characteristics to accomplish this intermediary job.

The main process steps that WTN support the most are steps two, three, and five. Step two, technology identification is supported by WTN mainly through its industry experience. This has been iterated before but because WTN understands industry and what they may want, and have the government experience to work with WL, WTN is able to identify technology that industry may want.

Step three, marketing, is also supported by WTN very well. WTN has the flexibility to hire personnel who have expertise in areas such as marketing. This ability allows WTN to market WL technologies more effectively than the Air Force. Also, WTN has the manpower to accomplish this task, the Air Force does not.

Step five, technology transfer, is supported by WTN through its facilitation of the process. Although they may concentrate on filling in the paperwork required with this type of bureaucracy, WTN allows the S&E to concentrate on the actual technology. This support makes attempting transfers more appealing to the S&Es. Although WTN does not have to do this, the lack of transfer education and manpower in the laboratory can cause the S&Es to not be interested in attempting to transfer their technology.

Analysis

Now that a comparison of AFMC's direction on technology transfer versus technology transfer at WL has been made, a look at the research questions is required in order to make an analysis. The following are the research questions identified in Chapter one:

1. What is the value added to the government of using a third party to promote the transfer of technology?

2. What do the current brokers do well that the government laboratory and/or local companies can not do on their own?
3. What are the qualifications/characteristics of the third party (personnel, resources) that allows them to as value?
4. What are the different services that third parties can offer to the government?

WTN Capabilities. The interviews show that due to the lack of resources and the bureaucracy innate in the government, third parties are becoming an invaluable resource. Technology transfer is required by each directorate within WL, creating the potential for each directorate to spend a great deal of time and money trying to fulfill this congressionally mandated mission. WTN, since they are funded by each directorate, allows each directorate to spend less money and manpower while still accomplishing their mission. The capabilities of WTN as identified in this research are as follows:

- Strategy development advisor.
- Industry experience that allows for
 - market analysis of laboratory technology.
 - determination of industry's technology needs.
 - industry monitoring for changes in technology needs and wants.
 - advisor on industry's abilities and transfer peculiarities.
 - contacts that can assist in the success of a transfer effort.
- Post-transfer monitoring to determine good and bad points of a transfer effort.
- Facilitate technology transfer by doing paper work and monitoring the progress of both the government and the firm
- Help WL negotiate the formal and informal working relationship with the acquiring firm.
- Marketing information about the laboratory, its resources, and means of access.

- Make initial contact with a firm on the laboratory's behalf and also make initial contact with the laboratory on the firm's behalf.

The experience mix at WTN is also a capability not found in the military circles, giving WTN an edge over strictly Air Force and strictly industry transfer offices. WTN seems to have the necessary qualifications and characteristics to accomplish their job.

Processes WTN Supports. As mentioned above, WTN supports steps two, three, and five or the master process. Step two, technology identification is required of WTN mainly because of its industry experience.

Step three, marketing, is supported by WTN. Based on WTN's flexibility to hire personnel who have expertise in areas such as marketing, WTN facilitates the marketing effort. This is based on WTN having the manpower to accomplish this task, unlike the Air Force.

Step five, technology transfer, is supported by WTN through their facilitation of the process. Filling in the paperwork required for transfer efforts is not a requirement of WTN, but accomplishing this big task, in this type of bureaucracy, allows the S&E to concentrate on the actual technology being transferred. This support makes attempting transfers more appealing to the S&Es. Although WTN does not have to do this, the lack of transfer education and manpower in the laboratory will cause the S&Es to not be interested in attempting to transfer their technology.

WTN Capabilities not Used. The main capabilities that the Air Force is not currently using is WTN's post-transfer administration ability. WTN monitors the outcome of technology transferred to member companies only for their own records. WTN could provide this service with all companies WL transfers with. The only other capability that

is not being used fully is WTN itself. All S&Es and focal points needs to be trained in the use and benefits of using WTN to facilitate their technology transfer efforts.

Conclusion

A comparison of how WL accomplishes technology transfer with suggestions from AFMC on how WL may accomplish technology transfer has been performed. An analysis of the research questions was done by looking at what WTN brings to the technology transfer process, the processes WTN supports, and the capabilities that are not being used. Chapter V will now make conclusions and recommendations based on what has been identified throughout this research effort. Also, further areas of research will be listed.

V. Conclusions and Recommendations

Introduction

This chapter presents the findings of the case study of the technology transfer intermediary, Wright Technology Network. The conclusions summarize answers to the research objectives described in Chapter I and suggest how these specific results can be applied to the technology transfer mission of the Air Force and Wright Laboratory. Also, recommended areas for additional research are identified as well as an overall summary of this research effort.

Conclusions

The conclusions reached in this research effort can be categorized into two areas. The first area is the conclusions reached in previous studies that are verified by this study. The second area is the conclusions reached during this research effort that are unique to this study. These conclusions are summarized in Table 2.

Table 2: Conclusions Summary

1. Third parties identify small and medium-sized firms that can benefit from federal-laboratory technology which are difficult for the laboratory to identify.
2. Third parties assist firms in targeting and defining a technology problem or interest.
3. Third parties help firms understand and negotiate the formal and informal working relationships with the laboratory.
4. Third parties disseminate information about the federal-laboratory system, its resources, and means of access.
5. Third parties make initial contact with firms on the labs behalf and with the laboratory on the firms behalf.
6. Third parties facilitate the transfer process through their ties with industry.
7. Third parties also facilitate the transfer process by doing the paperwork and monitoring the progress of the transfer.

Verified Conclusions. An initial finding from previous studies confirmed by this effort is that small and medium-sized firms that could benefit from federal laboratory technology are difficult for the laboratory to identify. The third party appears to be the best mechanism for WL to use in identifying these companies. With its industry experience, WTN is able to determine the firms that could best benefit from WL technology better than WL S&Es or the ORTA office. The Air Force needs to continue using WTN and other third parties for this expertise.

Second, third parties assist firms in targeting and defining a technology problem or interest; most importantly, separating technology from management, organization, and other issues. This service has been identified as a service that WTN provides to both WL and firms. This type of service benefits the Air Force as well as the firm by helping the firm actually identify where its technology problem or interest lies so that the Air Force only has requests from firms that need technology that it can supply. This benefit provides not only convenience for both the Air Force and the private firm, but also time and effort is saved.

Third, third parties help firms understand and negotiate the formal and informal working relationships with the laboratory. This has been found to benefit WL personnel because it allows the laboratory to concentrate on the technology transfer effort itself instead of having to take the time to inform the firm on the proper procedures and working requirements of the laboratory, saving time and effort for both the laboratory and the firm.

Fourth, WTN disseminates information about the federal laboratory system, its resources, and means of access. This refers to the marketing of the federal laboratory system. WTN

contacts many private firms and industries, disseminating information on what is available in WL and also provides the access to the laboratory and its technology.

Finally, WTN makes initial contact with firms on the laboratory's behalf and also makes initial contact with the laboratory on the firms' behalf. This benefit to the laboratory and the firm is immeasurable in the potential time that can be saved by a third party facilitating the initial meeting process. As mentioned previously, having WTN or any third party provide the initial contact between the laboratory and the firm allows WL to "weed out" firms that do not require actual technology from the laboratory and help the firm understand the laboratory system and its means of access.

Unique Conclusions. The first new conclusion reached is that WTN facilitates the success of technology transfer through its industrial ties. This effort by WTN has been found to promote the success of a transfer effort by providing a firm requiring technology access to other private firms that have the necessary expertise to provide marketing plans, financial backing, or any other requirement that is crucial to the transfer requirement, but is not provided by the Air Force.

WTN was also found to facilitate the transfer effort by doing the paperwork and monitoring the progress of the transfer. This facilitation allowed the S&E interviewed to concentrate on the technology itself and not to be burdened by the paperwork that he did not understand. This allowed the transfer to be a success for both the Air Force and the private firm involved. The Air Force needs to continue allowing WTN and third parties to provide this service.

Overall, the model developed by the TTO appears to be incorrect in its implementation. The TTO needs to take another look at how it should accomplish technology transfer, especially

in light of the limited resources available to the Air Force at this time. Using third parties in the technology transfer process can benefit both the Air Force and private industry. This research has shown that the following should be considered:

- Not-for-profit third parties, such as WTN for WL, should be used as the initial contact point for all inquiries about technology available in the federal laboratory. If calls are made to the TTO or the ORTA office, these calls should be referred to WTN so that they can “weed out” firms that may not actually require technology from the laboratory but require assistance in other ways.
- WTN should have the responsibility for most of the identification and marketing of the technology at WL. With the assistance of each directorates focal point, WTN should have access to what technologies are being worked on, so that WTN can identify which technology has commercial potential to allow for the proper marketing. Also, WTN will be able to inform the focal points of what type of technology industry is interested in so that S&Es can work on this type of technology. Reserve officers who come to WL to work during their two week annual requirement should also be used to market technology available in the laboratory.
- WTN should have the responsibility to solely provide the post-transfer administration. WTN has the ability to monitor the outcome of a transfer effort and to provide feedback as to what has become of the technology and what went well and did not go well. WTN could also provide the input or recommendation for awards for personnel in their transfer efforts, especially if AFMC does not take this responsibility.

Areas for Future Studies

Despite the findings described above, the case study of the utility of third parties in military to commercial technology transfer has identified many additional questions. The following is a listing of possible future research.

Examine other third parties used by Air Force laboratories to determine how they accomplish the Air Force technology transfer mission. One third party in particular that would be beneficial to examine is TECH, a state funded third party for Phillips Laboratory located at Kirtland Air Force Base, Albuquerque, New Mexico.

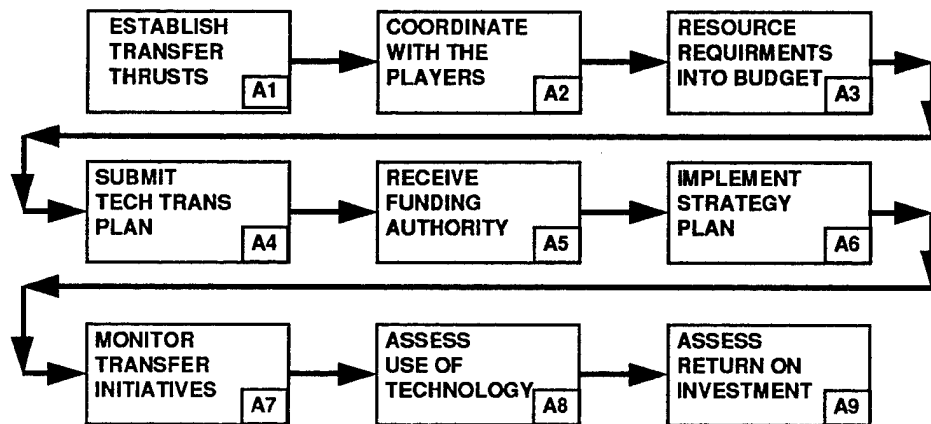
Another future research effort is to identify intermediaries, private and not for profit, that are used by individual states to promote the local economy (e.g. The Ben Franklin Technology Center of Southeastern Pennsylvania). These intermediaries could be benchmarked against the intermediaries used by Federal Laboratories such as WTN and TECH.

Future research should look at the responsibilities of the TTO, ORTA, Focal Points, and S&Es. Recommendations should be made in regard to what the different groups should do, if a group is no longer needed, and what responsibility the third party should have in the technology transfer process.

Finally, a study should be accomplished to examine the return on investment when using these intermediary organizations. This study would require several years of data, which is not available at this time.

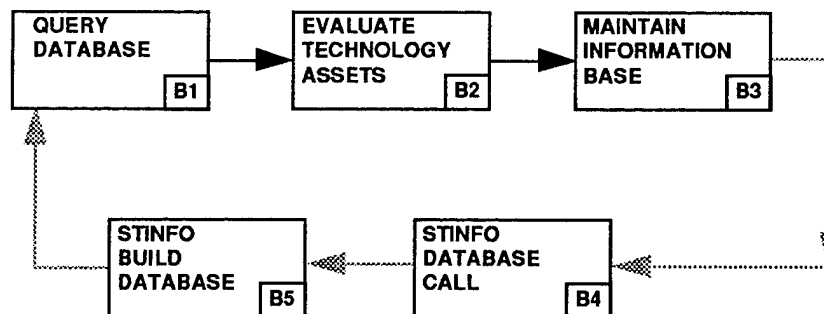
Appendix A: Local Area Process Steps

Major Step A: Strategy



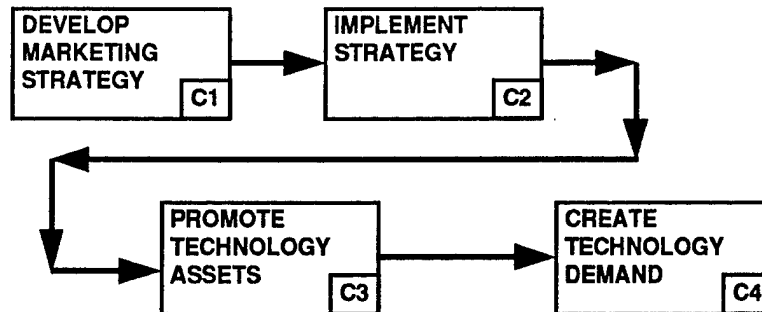
(AFMC Technology Transfer Handbook, 1995: D-3).

Major Step B: Identify Technology



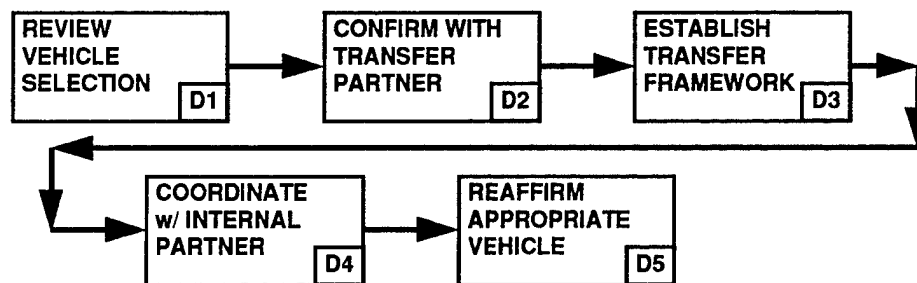
(AFMC Technology Transfer Handbook, 1995: D-4).

Major Step C: Marketing



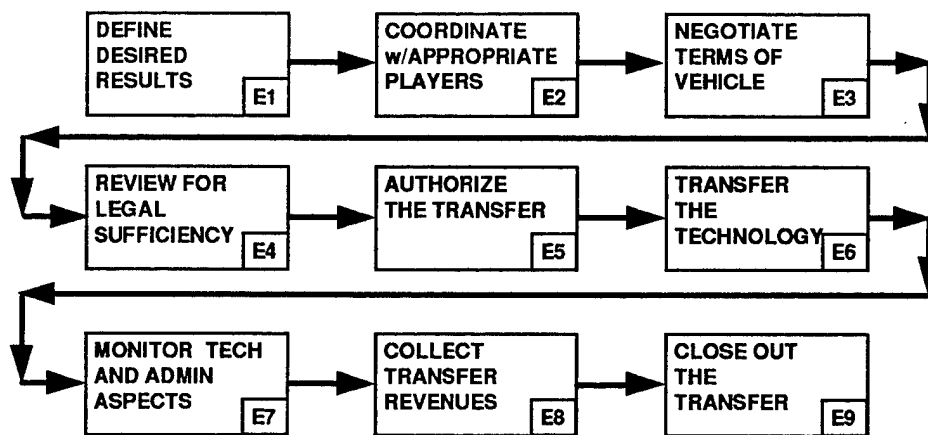
(AFMC Technology Transfer Handbook, 1995: D-5).

Major Step D: Identify Vehicle



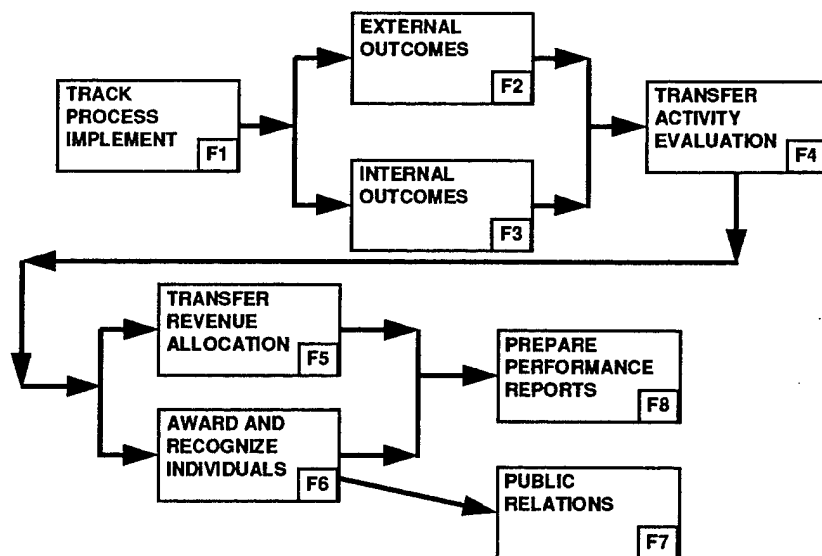
(AFMC Technology Transfer Handbook, 1995: D-6).

Major Step E: Transfer



(AFMC Technology Transfer Handbook, 1995: D-6).

Major Step F: Post-transfer Administration



(AFMC Technology Transfer Handbook, 1995: D-8)

Appendix B: Questions

Questions for WTN Management

1. What are your responsibilities?
2. What kind of training have you received to occupy this position?
3. What is your background?
4. How involved do you get with the technical aspect of the technology being transferred?

Strategy:

5. What kind of strategy does WL have? Is there an overall strategy or is it different for each transfer effort?
6. Do you have input in establishing transfer thrusts? How?
7. How are technical specialists assigned to a technology?
8. What kind of relationship does WTN and WL have?
9. Who is your counter-part at WL?

Identify Technology:

10. Do you identify firms that require technology? How?
11. Do you identify possible technology that firms need? How?
12. Do you maintain a database of potential technologies and firms requiring technology?
13. Do you stay involved with a firm that is acquiring technology through WTN? How long?
14. How mature or developed is the technology that you work with?

Marketing:

15. What methods are used to advertise WL capabilities?
16. What methods are used to implement WL strategy?

17. Do you feel you push technology to market or pull technology to an existing need? Why?

Identify Vehicle:

18. What kind of transfer vehicles does WTN usually use or are involved with?

19. To what extent do you use the following mechanism:

Advisory groups	Consensus Development Efforts
Research Collaborations	Demonstration Projects
Exchange of personnel	Comprehensive Centers
Technical Assistance	Information Clearhouses
Licensing	Personnel Exchanges/Field Agents
Spin-off Companies	Computerized Information Systems
Dissemination of Information	Library Service
Education	Collaborative R&D Projects
Colloquia/Published Reports	Other mechanism

20. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything?

Transfer:

21. Who defines the desired outcome of any transfer effort?
22. Do you negotiate the terms of the transfer transaction for any of the following?
23. commercial firm?
24. the government?
25. Who is responsible for reviewing the transactions for legal sufficiency?
26. How are transfers authorized?
27. How long does a usual transfer effort take?
28. How is a transfer effort closed-out?

Post-Transfer Administration

29. Do you monitor the outcome of technology once it has been transferred? How?
30. What kind of evaluations on transfer activities are performed in order to maintain continuous quality improvement?
31. What kind of recognition and awards are used for WTN POC's on their transfer efforts?
32. Are you involved in or with public relations? If so, what kind?
33. What other areas need to be addressed that have not been?

Questions for WTN Technical Specialists

1. What are your responsibilities?
2. What kind of training have you received to occupy this position?
3. What is your background?
4. How involved do you get with the technical aspect of the technology being transferred?

Strategy:

5. What kind of strategy does WL have? Is there an overall strategy or is it different for each transfer effort?
6. Do you have input in establishing transfer thrusts? How?
7. How are S&E's assigned to a technology?
8. What kind of relationship does WTN and WL have?
9. Who is your counter-part at WL?

Identify Technology:

10. Do you identify firms that require technology? How?
11. Do you identify possible technology that firms need? How?
12. Do you stay involved with a firm that is acquiring technology through WTN? How long?
13. How mature is the technology that you work with?

Marketing:

14. What methods are used to advertise WL capabilities?
15. What methods are used to implement WL strategy?
16. Do you feel you push technology to market or pull technology to an existing need? Why?

Identify Vehicle:

17. What kind of transfer vehicles do you usually use or are involved with?

18. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything?

Transfer:

19. Who defines the desired outcome of any transfer effort?
20. Do you negotiate the terms of the transfer transaction for any of the following?
commercial firm?
21. the government?
22. How are transfers authorized?
23. How long does a usual transfer effort take?
24. How is a transfer effort closed-out?

Post-Transfer Administration

25. Do you monitor the outcome of technology once it has been transferred? How?
26. What kind of evaluations on transfer activities are performed in order to maintain continuous quality improvement?
27. Are you involved in or with public relations? If so, what kind?
28. What other areas need to be addressed that have not been?

Questions for WL Science and Engineers

1. What are your responsibilities?
2. What kind of training have you received to occupy this position?
3. What is your background?

Strategy:

4. What kind of relationship does WTN and WL have?
5. Who is your counter-part at WL?

Identify Technology:

6. Do you identify firms that require technology?
7. How do you identify possible technology that firms need?
8. How mature or developed is the technology that you work with?

Marketing:

9. What methods are used to advertise WL capabilities?
10. Do you feel you push technology to market or pull technology to an existing need? Why?

Identify Vehicle:

11. What kind of transfer vehicles does WL usually use or are involved with?
12. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything? If not, do you know which one to use?

Transfer:

13. Who defines the desired outcome of any transfer effort?
14. How involved do you get during negotiation of terms of the transfer transaction for the government?
15. Who is responsible for reviewing the transactions for legal sufficiency?
16. How are transfers authorized?

17. How long does a usual transfer effort take?

Post-Transfer Administration

18. Do you monitor the outcome of technology once it has been transferred? How?

19. What kind of recognition and awards are used for transfer efforts?

20. What other areas need to be addressed that have not been?

Questions for WL Transfer Focal Point

1. What are your responsibilities?
2. What kind of training have you received to occupy this position?
3. What is your background?
4. How involved do you get with the technical aspect of the technology being transferred?

Strategy:

5. What kind of strategy does WL have? Is there an overall strategy or is it different for each transfer effort?
6. Do you have input in establishing transfer thrusts? How?
7. How are S&E's assigned to a technology?
8. What kind of relationship does WTN and WL have?
9. Who is your counter-part at WTN?

Identify Technology:

10. Do you identify firms that require technology? How?
11. Do you identify possible technology that firms need? How?
12. Do you maintain a database of potential technologies and firms requiring technology?
13. Do you stay involved with a firm that is acquiring technology through WTN?
How long?
14. How mature or developed is the technology that you work with?

Marketing:

15. What methods are used to advertise WL's capabilities?
16. Do you feel you push technology to market or pull technology to an existing need?
Why?

Identify Vehicle:

- 17. What kind of transfer vehicles does WL usually use or are involved with?
- 18. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything?

Transfer:

- 19. Who defines the desired outcome of any transfer effort?
- 20. Do you negotiate the terms of the transfer transaction for the government?
- 21. Who is responsible for reviewing the transactions for legal sufficiency?
- 22. How are transfers authorized?
- 23. How long does a usual transfer effort take?
- 24. How is a transfer effort closed-out?

Post-Transfer Administration

- 25. What kind of evaluations on transfer activities are performed in order to maintain continuous quality improvement?
- 26. Are you involved in or with public relations? If so, what kind?
- 27. What other areas need to be addressed that have not been?

Questions for WL Management

1. What are your responsibilities?
2. What kind of training have you received to occupy this position?
3. What is your background?
4. How involved do you get with the technical aspect of the technology being transferred?

Strategy:

5. What kind of strategy does WL have? Is there an overall strategy or is it different for each transfer effort?
6. Do you establish transfer thrusts? How?
7. Do you assign S&E's to a technology? How?
8. What kind of relationship with WTN do you have?
9. Who is your counter-part at WTN?

Identify Technology:

10. Do you identify firms that require technology? How?
11. Do you identify possible technology that firms need? How?
12. Do you maintain a database of potential technologies and firms requiring technology?
13. Do you stay involved with a firm that is acquiring technology through WTN? How long?
14. How mature or developed is the technology that you work with?

Marketing:

15. What methods are used to advertise WL capabilities?
16. What methods are used to implement WL strategy?
17. Do you feel you push technology to market or pull technology to an existing need? Why?

Identify Vehicle:

18. What kind of transfer vehicles does WTN usually use or are involved with?

19. To what extent do you use the following mechanism:

Advisory groups	Consensus Development Efforts
Research Collaborations	Demonstration Projects
Exchange of personnel	Comprehensive Centers
Technical Assistance	Information Clearhouses
Licensing	Personnel Exchanges/Field Agents
Spin-off Companies	Computerized Information Systems
Dissemination of Information	Library Service
Education	Collaborative R&D Projects
Colloquia/Published Reports	Other mechanism

20. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything?

Transfer:

21. Who defines the desired outcome of any transfer effort?

22. Do you negotiate the terms of the transfer transaction for any of the following?

23. commercial firm?

24. the government?

25. Who is responsible for reviewing the transactions for legal sufficiency?

26. Are you required to authorize all transfers or are WL POC's empowered to authorize their efforts?

27. How long does a usual transfer effort take?

28. How is a transfer effort closed-out?

Post-Transfer Administration

29. Do you monitor the outcome of technology once it has been transferred? How?
30. What kind of evaluations on transfer activities are performed in order to maintain continuous quality improvement?
31. What kind of recognition and awards are used for WL POC's on their transfer efforts?
32. Are you involved in public relations? If so, what kind?

Appendix C: Transfer Mechanisms

Technology Transfer Mechanisms		
Mechanisms	Description	Features/Characteristics
<p>Cooperative Research and Development Agreement (CRDA)</p> <p>Refer to 31 U.S.C. 6305 and 10 U.S.C. 2371</p>	<p>A CRDA is an agreement between one or more federal laboratories and one or more non-federal parties under which the Government, through its laboratories, provides personnel, facilities, or other resources with or without reimbursement (but not funds to non-federal parties). The non-federal parties provide funds, people, services, facilities, equipment, or other resources to conduct specific research or development efforts that are consistent with the agency's mission.</p>	<ul style="list-style-type: none"> • Requirement that no funds can be provided to collaborating party. • Not subject to 31 U.S.C. 6303-6305 terms for procurement contracts, grants, or cooperative agreements. • Rights to inventions and other intellectual property are negotiated as part of the agreement. • Trade secret information is protected from release under the FOIA, 5 U.S.C. 552 et. seq. • Not an "assistance" or procurement. • Project manager and legal counsel draft agreement (not a "contracting" instrument).
<p>Small Business Innovation Research (SBIR)</p> <p>Refer to 15 U.S.C. 638, Small Business Act</p>	<p>The SBIR program is designed to stimulate technological innovation among small businesses while providing new, cost-effective, technical and scientific solutions to challenging problems. Contracts are awarded based on scientific and technical merit for meeting Air Force R&D needs along with the proposal's potential for commercialization.</p>	<ul style="list-style-type: none"> • Three-phase program. • Throughout the program, small businesses are encouraged to market SBIR sponsored technology to private sector. • In final phase of project, small business must be funded by non-federal sources of capital for commercial applications of the SBIR-funded research and development. • Four-year confidentiality limit on data. • Contractor may obtain title to inventions.
<p>Small Business Technology Transfer Program (STTR)</p> <p>Refer to 15 U.S.C. 638</p>	<p>Similar to the SBIR program. Awards are made to small business firms for research and development conducted jointly by small businesses and research institutions. Contracts are awarded to offerors who propose innovative concepts to solve defense-related scientific and engineering problems; especially those concepts that have a high potential for commercialization in the private sector.</p>	<ul style="list-style-type: none"> • Three-year pilot program starting in FY94. • Three phases (similar to SBIR program). • In final phase of project, small business and research institution are expected to use private capital and/or non-STTR funds to pursue commercial applications of the research and development. • Not less than 40% of the work to be performed by small business. • Not less than 30% of the work must be performed by a research institution (university, non-profit research institution, or FFRDC).

Technology Transfer Mechanisms

Mechanisms	Description	Features/Characteristics
Collegial Interchange, Conference, Publication	The informal and free exchange of information among colleagues.	<ul style="list-style-type: none"> Includes: <ul style="list-style-type: none"> presentation at professional and technical conferences. publication in professional magazines (caution should be taken to avoid premature disclosure of information that may be the subject of a patent application or proprietary data).
Consulting to the Laboratory Refer to AFI 61-301	A party outside the laboratory provides advice and/or information.	<ul style="list-style-type: none"> Formal written contract, generally short-term and specific. Consultant certifies that no intellectual property conflicts exist.
Consulting by Laboratory Employees Refer to AFI 61-301	Consultation provided to a private sector party by laboratory employees to further technology transfer.	<ul style="list-style-type: none"> Laboratory must approve of the laboratory personnel consulting arrangement. Avoid conflict of interest. Intellectual property aspects require care.
Exchange Program Refer to AFI 61-301	A transfer of people either to the laboratory from another party or from the laboratory to another party to exchange expertise and information.	<ul style="list-style-type: none"> Usually for up to one year.
Use of Facilities Refer to AFI 61-301	User facilities are unique, complex, experimental scientific facilities including equipment and expertise at a governmental agency designated by the Government for use by the technical community, universities, industry, other laboratories, and other Government entities.	<ul style="list-style-type: none"> Includes designated user facilities and other user resources. Research may be conducted on a proprietary or nonproprietary basis. For proprietary R&D, full cost recovery is required. Patent rights generally go to inventor and proprietary data of the user can be protected. For nonproprietary R&D, title to inventions goes to the user but data generated are freely available. If funded under another Government contractor or international agreement, users are subject to those intellectual property clauses.

Technology Transfer Mechanisms

Mechanisms	Description	Features/Characteristics
<p>Contracts (General)</p> <p>Refer to 31 U.S.C. 6303</p>	<p>The Government and a contractor enter into a contract (an acquisition instrument) in which the contractor is required to provide supplies and services to the Government. Types of contracts include cost, cost-sharing, and fixed-price.</p>	<ul style="list-style-type: none"> • Government's purpose is to acquire goods, services, or research for the primary benefit of the Government. • Can be used to fund R&D that may eventually be transferred to the private sector. • All contractors regardless of size may obtain title to inventions, but Government normally retains Government Purpose License Rights (GPLR) and "march-in" rights. • Competition laws and requirements apply. • Governed by FAR and procurement statutes (CICA, Procurement Integrity, etc.).
<p>Grants</p> <p>Refer to 31 U.S.C. 6304</p>	<p>Assistance in which there will be no significant involvement between the Government and the recipient during performance.</p>	<ul style="list-style-type: none"> • DoD policy is to award research grants to educationals, nonprofits, and state and local governments only. • Research grants to educationals must be competed. • Used extensively to support research. • Normally recipient obtains title to inventions, but Government retains GPLR.
<p>Licensing from the Government to Private Sector</p> <p>Refer to AFI 51-303, Intellectual Property - Patents, Trademarks, and Copyrights</p>	<p>Licensing is the transfer of less-than-ownership rights in intellectual property to a third party to permit the licensee to use intellectual property.</p>	<ul style="list-style-type: none"> • Can be exclusive or nonexclusive, for a specific field use, for a special geographical area, or U.S. or foreign usage. • Required that a major portion of the royalties return to the Government. • Preference for U.S. industry and small businesses. • Potential licensee must present plans to commercialize the invention. • Government retains a nonexclusive, royalty-free worldwide Government purpose license to the invention.
<p>Licensing from the Private Sector to Government</p> <p>Refer to AFI 51-303</p>	<p>Licensing is the transfer of less-than-ownership rights in intellectual property to a third party to permit the licensee to use intellectual property.</p>	<ul style="list-style-type: none"> • Government may use private inventions for Government purposes subject to payment of reasonable compensation. • Must follow existing procurement rules and instructions. • Must be approved by HQ USAF/JA.

Appendix D: Interview Data

WTN Management - President

Background:

- Retired O-6
- Academy grad, pilot training
- Chief of staff of ASC
 - Working budget and with congress.

Things that led up to WTN:

- 2 tech transfer laws
 - Law of 1986 - count CRDA's
- General Lowe started Integrated product development
 - What is tech transfer?
 - Some claimed that tech transfer has been done for years by the AF.
 - Tech papers
 - Contracts
 - People leave the Government

Great Lakes Science and Technology Partnership

- 1994 Governors established this partnership within the 8 great lakes region.
 - Wanted to establish some kind of technology agenda.
- Mission is to organize and coordinate the public and private efforts to increase the use of advanced technology by industries of the great lakes states. May translate to technology pull.
- 3 Goals:
 - To promote the cooperation and leveraging of regional science and technology resources into a global competitive advantage. Create more information sharing and awareness of who the experts are in particular fields of science and technology so that they are more accessible to manufacturers.
 - Develop long term private-public projects of regional interest - Industry working together with government.
 - Develop regional proposals for private and public sector funding
 - Bottom line - rapid technology development and adoption. - Means tech transfer
- 4 Projects the Governors have endorsed:
 - Great Lakes Alliance - automotive industry. New ways of doing business.
 - Great Lakes Composite Program
 - Great Lakes Manufacturing Network
 - Advanced Manufacturing Education
- Do not need all eight states on board, can have 2 states. Can come on board at any time. Want efforts as wide spread as possible.

- A lot of technology but not a lot of tech transfer - See the product being built by a company
- WTN helps by augmenting what the ORTA does and help individual companies.
- WTN has the only Partnership Intermediary Agreement in the Air Force.
- Technology transfer act of 1995 incentivizes companies by allowing them to have a sole license in a region of interest. And it incentivizes the government S&E by allowing them to have some of the up front money.
- WTN has a tech agent for NTTC
- Technology Transfer Equation
 - $\text{Technology Transfer} = \text{technology} * \text{entrepreneur} * \text{capital} * \text{good business practices}$
 - The AF and Government brings only the technology to the equation.
 - A company WTN is working with needs to have entrepreneur, capital, and good business practices.
 - Can steer the AF away from companies who don't have these or can steer a company who needs these to companies who can provide this.
- AF needs to improve the quality of it's CRDA's
 - What's the return on investment - more than fees and royalties
 - What's the probability of success
 - What's the contribution to the AF primary mission
- Pull is problem solving for a company
 - Work with a company to define a companies problem.
 - Frequently the problem they say is not really what their problem is.
 - Find a S&E that can help. Bring the two parties together
 - Problem is either solved immediately or CRDA or agreement is made.
 - Task order agreement - pass money back to the government as well as receive.
 - Work done pro bono - No intellectual property, WTN signs a contract with the company, the company pays WTN and then WTN takes the money to the government for what ever purpose they see fit.
- Focus areas: Automotive, medical, law enforcement, general aviation, agricultural, environment.
- Nobody cataloging everything WL is doing in focus areas, especially automotive.
- WTN - has built an internal team who's mission is tech transfer. Has attempted to build trust with organizations. Open and honest communication. Honesty is extremely important.
- CRDA's are usually 3 years long. Some of the most valuable information is WL and WTN can influence a company by informing them to not go into a certain area. Everyone is working different areas.
- CRDA is not measuring everything WL and WTN is doing.
- WTN developed a marketing plan for WL. This is actually a commercialization plan. A commercialization effort affects an industry.

- Working with these areas generates regional support for WL.
- WTN will outsource to companies who have money to loan or who can generate plans (marketing, strategic, etc.) for companies.

WTN Management - Chief Technical Officer

1. What are your responsibilities?

Chief technical officer - Mostly working with the staff people in terms of technical projects and where they are going.

2. What kind of training have you received to occupy this position?

Mainly OJT - Had some training and read a masters thesis that was based on barriers to technology transfer. All training deals with the legal aspect of technology transfer. Training is not the real problem. Difficult problem is bringing industry and the government together.

3. What is your background?

President of Fortune 500 company, other industry experience, use contacts from industry firms that have had for years to contact firms.

4. How involved do you get with the technical aspect of the technology being transferred?

Not much. This is the job of the S&E. Need to know enough of the technical aspect to bring industry and the government together. First project with a company will be a problem solving thing. This is the first thing that opens the door to tech transfer. A company that had a product used in the hospital operating room made out of stainless steel. After spending 22 months trying to figure out why the instrument was rusting company was told to call this WTN manager. He analyzed the problem asked for parts and then took these parts to the materials directorate. 6 Ph.D. scientists and engineers with over 100 man years of experience solved the problem in 1 hour, although they performed other subsequent tests to verify that they had found the correct problem. General Ferguson said to concentrate on what the Air Force has developed to commercialize instead of what companies come and ask for. Experience at WTN is coming from 75% from government service and 25% industry. Need more industry experience and connections.

Strategy:

5. What kind of strategy does WTN have? Is there an overall strategy or is it different for each transfer effort?

There is an overall strategy but there is a different strategy for each transfer effort. The question I have is how does the Air Force get a return on investment. The Air Force received nothing for the corrosion example. It may have saved 30-40 jobs from going to Germany, which is where the competition is located. If there is not a return for the AF, the AF should not do it. This return could be in PR. Should get a lot of visibility on products whether or not they receive money.

6. Do you have input in establishing transfer thrusts? How?

No input. Transfer thrusts are a concerted focus on Bio-medical, automotive, law enforcement, general aviation which came from WL.

7. How are points of contacts assigned to a technology?

Haphazardly. Whoever answers the phone. Once the POC hears and talks about the problem they are the experts and keep the project. A lot of cases are taken care of before they ever reach WL.

8. What kind of relationship does WTN and WL have?

It has been spotty. WL has the experience and WTN is trying to show their usefulness and ability in helping the laboratory transfer technology.

9. Who is your counter-part at WL?

ORTA and WL technology transfer office

Identify Technology:

10. Do you identify firms that require technology? How?

In Columbus have technology after hours once a quarter which is a forum that allows businesses to talk about their needs. Technical shows. Instrumentation Development forum once a month.

11. Do you identify possible technology that firms need? How?

Yes, through experienced personnel

12. Do you maintain a database of potential technologies and firms requiring technology?

Yes, have one started but it needs work. Mainly used NTTC before their mission changed.

13. Do you stay involved with a firm that is acquiring technology through WTN?
How long?

Did not ask this question.

14. How mature or developed is the technology that you work with?

A lot is fairly mature or has been developed for years. Most is not leading edge.

Marketing:

15. What methods are used to advertise WL capabilities?

Every call made on a company, direct mail. Go to events make contacts and handout literature.

16. What methods are used to implement WL strategy?

WL's technology transfer office helps direct WTN to accomplish WL's strategy.

17. Do you feel you push technology to market or pull technology to an existing need?
Why?

Both, company comes to WTN or WL goes to WTN.
Help other companies write marketing plans and strategies. Also direct them to companies that can help.

Identify Vehicle:

18. What kind of transfer vehicles does WL usually use or are involved with?

CRDA's, WL just does it. Also do test agreements and licensing agreements

19. To what extent do you use the following mechanism:

Advisory groups	Consensus Development Efforts
Research Collaborations	Demonstration Projects
Exchange of personnel	Comprehensive Centers
Technical Assistance - Use	Information Clearhouses - Use

Licensing - Use

Spin-off Companies

Dissemination of Information

Education

Colloquia/Published Reports - Use Other mechanism

Try to be the gateway to get a company what they need to have. May need to talk to University of Dayton to get what is needed, not only WL.

Personnel Exchanges/Field Agents

Computerized Information Systems - Use

Library Service - Use

Collaborative R&D Projects - Use

20. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything?

No, Each one has their own situation.

Transfer:

21. Who defines the desired outcome of any transfer effort?

Joint between the AF and the company.

22. Do you negotiate the terms of the transfer transaction for any of the following?

commercial firm?

No

the government?

No, like a realty agent.

23. Who is responsible for reviewing the transactions for legal sufficiency?

Company and Tom Kundert at legal

24. How are transfers authorized?

The Air Force and the company.

25. How long does a usual transfer effort take?

Each one is different. Take one hour to three years

26. How is a transfer effort closed-out?

Final report written by the AF or the company.

Post-Transfer Administration:

27. What does WTN do while the transfer is being done?

Check up with the company or the Air Force at least twice a month.

28. Do you monitor the outcome of technology once it has been transferred? How?

Yes, Try to track how many jobs created, etc.

29. What kind of evaluations on transfer activities are performed in order to maintain continuous quality improvement?

Every other week WTN has a meeting to determine how each project is progressing.

A lot of evaluations are done by just doing it.

30. What kind of recognition and awards are used for transfer efforts?

At WTN use financial bonus. Not real big on awards. People work because they want to work here at WTN.

31. Are you involved in or with public relations? If so, what kind?

Work with base PA people.

32. What other areas need to be addressed that have not been?

Do a lot of work with start ups.

WTN Technical Specialist

1. What are your responsibilities?

Technology specialist, only WTN employee who provides on-site contractor support. Acts as interface between WTN and WL - ORTA. Facilitates the information gathering for both WL and WTN. Just being physically located in the WL office building has aided in the communication between WL and WTN.

2. What kind of training have you received to occupy this position?

24 years with the Air Force Retired LtC.
Courses, OJT, conferences.

3. What is your background?

A/C maintenance, Propulsion SPO, taught at the academy, propulsion and aero directorate, C-17 SPO, chief engineer for NASP. OJT from AF active duty. Does not have the business sense. Has Ph.D. in aero.

4. How involved do you get with the technical aspect of the technology being transferred?

Not involved in the technology. The tech specialist located at the research park will get very involved, more on technology pull efforts. Technology push, will get very involved. If the lead then will dig into and try to understand the physics of what is going on.

Strategy:

5. What kind of strategy does WL have? Is there an overall strategy or is it different for each transfer effort?

Look at strategic plan. WL tech transfer marketing plan was the first task the WTN was asked to do under the intermediary partnership agreement contract. Which conference should WL attend. What magazines should they put articles and tech transfer advertisements. Strategy is overall and then each outreach may have a different action plan for it, but one strategic plan.

6. Do you have input in establishing transfer thrusts? How?

Has put input in establishing transfer thrusts on a daily basis.

7. How are S&E's assigned to a technology?

Work in areas of expertise. Technology is defined by the S&E based on interest and research efforts. individuals come up with the ideas.

8. What kind of relationship does WTN and WL have?

Close, cooperative, collaborative relationship. Since not for profit organization, able to concentrate on what the Air Force needs instead of turning a profit.

9. Who is your counter-part at WL?

WL Technology Transfer Office personnel.

Identify Technology:

10. Do you identify firms that require technology? How?

Firms come to WTN with needs and then WTN goes to WL with those needs. Do not go to firms and ask what they need.

11. Do you stay involved with a firm that is acquiring technology through WTN?
How long?

If the lead than yes.

12. How mature or developed is the technology that you work with?

6.1 - 6.3 Full gamut

Marketing:

13. What methods are used to advertise WL capabilities?

Every possible method. TV, magazines, newspaper.

14. What methods are used to implement WL strategy?

WTN on board. Technical assistant programs, testing, assessing WL technology for commercialization. Finding a market for it.

15. Do you feel you push technology to market or pull technology to an existing need?
Why?

Both, more pull in the past but now doing more push.

Identify Vehicle:

16. What kind of transfer vehicles does WL usually use or are involved with?

CRDA's, Educational partnership agreements, Partnership intermediary agreements, licensing.

17. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything?

No, there is not a check list but there is a description that can be done with each vehicle. Inherently there is a check list. Write-up located in the technology transfer handbook, WL marketing plan, etc. More than what is found in handbook, may just do it.

Transfer:

18. Who defines the desired outcome of any transfer effort?

Collaborating partner defines what they want, WL defines what they want. An intermediary like WTN facilitates each sides issues until resolved.

19. Do you negotiate the terms of the transfer transaction for any of the following?

commercial firm?

Involved but not up to WTN as to the terms of the transaction. This is up to commercial firm and government. May make recommendations to the commercial firm as to what the government has accepted and expects from past efforts.

the government?

Make recommendations on what the company wants and their possible range.
Realtor

20. How are transfers authorized?

Col Davis signs the formal agreements. Directorates authorize some and if the company calls directly to the S&E and they send information on it.

21. How is a transfer effort closed-out?

WTN final report. Not the same or is intended to be the DTIC final report requirement issued by the ORTA. This WTN final report is available to the laboratory and can possibly be modified to work as the DTIC requirement.

Post-Transfer Administration:

22. Do you monitor the outcome of technology once it has been transferred? How?

Not formally. When in contact with the company during future discussions will maintain a feel for what is happening with technology. Do formally follow member company's and their efforts. Not formally non members.

23. What kind of evaluations on transfer activities are performed in order to maintain continuous quality improvement?

Every other week have a CRDA meeting evaluating what is being done on each CRDA. Leads to a list of action items of what each member must do. Go over technology assistant efforts also, which may not lead to a CRDA.

24. Are you involved in or with public relations? If so, what kind?

Yes, extremely involved. Each CRDA has a public release statement required.

25. What other areas need to be addressed that have not been?

WTN Technical Specialist

1. What are your responsibilities?

Create WTN home page and interface it with WL. And also technology specialist to transfer technology from WL to commercialize technology. Worked with NTTC and still maintain a link to NTTC database. Can perform searches via the internet and NTTC. NTTC has provided a lot of technical assistance but not many CRDA's resulted from this effort. How do you measure their work? WTN has facilitated the access to WL technology and S&E's. WTN is helping to create the training and understanding of technology transfer. Consider WTN as missionary work and the WTN employees go out and preach the gospel of tech transfer. WTN performs all the paperwork, allowing the S&E's to concentrate on their research.

2. What kind of training have you received to occupy this position?

OJT

3. What is your background?

Formerly Worked for NTTC. NTTC has a database on technology from the 800 or so federal labs. A company would call up and ask for information on a certain technology or about a technology and NTTC would do a database search. Identify labs that could help them and then set the company up with the tech transfer people. NTTC has changed their focus, they are concentrating on NASA only. No longer with all the other labs. Have a \$0 funded contract with NTTC and will begin contract if able to be funded to work with other labs again. NTTC is also trying to provide training to Wright Lab and other labs to train all the S&E's on tech transfer. NTTC would like to get this training contract.

4. How involved do you get with the technical aspect of the technology being transferred?

Varies. Have a basic understanding. On a pull where the company comes to WTN asking for a technology, need basic understanding of what is being sought and then have a basic understanding of what is available and then try to match them. On a push, need a stronger understanding. Need to understand the technology to determine if a technology is right for a certain market. Need to understand the business and technical side of how things operate. Need to have the manager and scientists in line or the transfer is dead in the water. No formula. Very individual and a lot of contact with individual people is required. Go to focal points to obtain information on what technology is being worked on. This is a responsibility of the focal points. Individual scientists are now coming forth. Scientists can make up to \$100,000 in royalties a year off of a company. General aviation outreach is doing quite well since it is in the interest and field of the S&E's.

Strategy:

5. What kind of strategy does WL have? Is there an overall strategy or is it different for each transfer effort?

Did not ask this question.

6. Do you have input in establishing transfer thrusts? How?

Did not ask this question.

7. How are S&E's assigned to a technology?

Did not ask this question.

8. What kind of relationship does WTN and WL have?

Did not ask this question.

9. Who is your counter-part at WL?

Did not ask this question.

Identify Technology:

10. Do you identify firms that require technology? How?

Need to keep the technology in the fields of the S&E's. They are more interested in it and it is easier for the S&E's to work on it if it is in their general line of work.

Beginning to organize efforts better. Tailoring approach to meet the outreach areas.

11. Do you identify possible technology that firms need? How?

Go to focal points to determine what technology is being worked on in the labs. Their responsibility is to know what technology is available. Received around 75 patents to look through and determine if any of the technology has commercial potential. Individual scientists are beginning to come forth with technology that they have that may have commercial potential.

Companies are beginning to understand how to do technology transfer and WTN is helping immensely. Labs are doing better at facilitating technology transfer. Bureaucracy of doing a CRDA has turned off many people. May take WTN 6-7 months to do a CRDA but for a firm to do this may be nearly impossible. Companies now are beginning to say that technology transfer is a viable way to get technology. All the Labs are on the Web. WTN trying to link web sites together. Labs are getting better at doing public relations. WTN writes up success stories on CRDA's. Labs are doing better at saying they are valuable. Does WTN try to bring firms actually to Ohio or take technology to other states?

Air Force and the State of Ohio fund WTN. Air Force is national but the State of Ohio wants firms here. Currently striving to operate in the ten state region. If the technology is out of state will make every effort to have Ohio companies supply this out of state business with parts.

Interface with other third parties is doing better. Very antagonistic in the beginning. Seeing partnering that wasn't there before. Now everyone is finding their own niche and sticking to that niche.

What is the overall goal of WTN with technology transfer?

First is to help Wright Patterson and the state of Ohio. The state and AF cannot continue to fund WTN indefinitely. Will need to be self sufficient at sometime. This requires WTN to be somewhat selective. Long term goal is to transfer as much technology from the Air Force as possible. But will have to generate their own revenue in the future. Unique role of WTN with a foot in private sector and a foot in the public sector. A strictly private company would ignore those who can't pay or are not willing to pay for technical assistance or advice. WTN will not ignore them although these can not be their only customers. Best companies are those that know marketing, and know sales, and know manufacturing. WTN trying to be organized with different skill sets to deliver the best technology to market.

12. Do you maintain a database of potential technologies and firms requiring technology?

Did not ask this question.

13. Do you stay involved with a firm that is acquiring technology through WTN?
How long?

Companies always need help to develop marketing plans. the lions share of the work is after the CRDA is signed. WTN has helped companies with marketing plans and paper work and different areas needed by the company but generally try to find other companies who are expert in the needed area and have them perform the work. Don't just hand them off. Need to help facilitate what the expert company is doing. Have found that if they don't do this things will fall through the cracks. Don't charge fees unless sign a service agreement. No kickbacks from these companies.

14. How mature or developed is the technology that you work with?

Technology maturity varies. Technology needs to be tailored or modified to a companies need. For every research dollar spent the company needs to put ten dollars into development, and for every dollar into research need to put 100 dollars into sales distribution and marketing. Lab does not see this. Needs to be redesigned for a specific use.

Marketing:

15. What methods are used to advertise WL capabilities?

Mentioned before.

16. What methods are used to implement WL strategy?

Mentioned before.

17. Do you feel you push technology to market or pull technology to an existing need?
Why?

As time goes on more of a push. Push gives more control on who to work with. WTN understands the technology and the market place and can find the company with the best ability for success in developing and marketing the technology. The Air Force makes the final decision. WTN does not pick the winners but can put the AF into contact with the stronger companies.

Identify Vehicle:

18. What kind of transfer vehicles does WL usually use or are involved with?

CRDA is the vehicle of choice.

The AF CRDA is more flexible and wants to make a profit. Wants a return on investment. Makes a better business arrangement compared to getting something for free.

19. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything?

No.

Transfer:

20. Do you negotiate the terms of the transfer transaction for any of the following?

commercial firm?

Yes, as an advisor only.

the government?

Yes. Don't take sides and try only to help. Act as middle person. AF not trying to get rich and firms getting a good deal.

21. How long does a usual transfer effort take?

Can take a few hours to 4 years. Technical assistance is usually the shortest. Tracking of technical assistance is required. This is a problem because they are hard to measure and quantify. Can really help a company and keep them in business but does not create jobs.

22. How is a transfer effort closed-out?

Did not ask this question.

Post-Transfer Administration:

23. Do you monitor the outcome of technology once it has been transferred? How?

Only on a limited basis.

24. What kind of evaluations on transfer activities are performed in order to maintain continuous quality improvement?

Every other week CRDA meeting.

25. What kind of recognition and awards are used for transfer efforts?

Did not ask this question.

26. Are you involved in or with public relations? If so, what kind?

Did not ask this question.

27. What other areas need to be addressed that have not been?

There are none.

WTN Technical Specialist

1. What are your responsibilities?

To transfer technology from the laboratory to industry.

2. What kind of training have you received to occupy this position?

Worked with industry for 7 years. Worked as a consultant, designing systems.
Have BS degree in EE.

3. What is your background?

Been with WTN for 7 months.

4. How involved do you get with the technical aspect of the technology being transferred?

Don't need to know the exact physics behind the technology but need to know enough to know what company to best match this technology with. Stays with the business side of working with technology.

Strategy:

5. What kind of strategy does WL have? Is there an overall strategy or is it different for each transfer effort?

Did not ask this question.

6. Do you have input in establishing transfer thrusts? How?

Did not ask this question.

7. How are S&E's assigned to a technology?

Did not ask this question.

8. What kind of relationship does WTN and WL have?

Feel they have a good relationship. Explains to S&Es and focal points what WTN's mission is and that they help them with the transfer effort and WTN is a mechanism to help with the tedious work. Feels WL has many people who want to help other people. Work through focal points. Trying to help focal points with their work.

9. Who is your counter-part at WL?

Focal-points - Use them before doing anything with the directorates. Feel they are an expansion of the focal points. People calling WTN have not been referred by TTO or focal points. Other companies may refer WTN but the labs do not. At least not aware of any.

Identify Technology:

10. Do you identify firms that require technology? How?

Hit and miss. Once receive technology from laboratory first try to determine what industries use or can use this type of technology. A lot of calling and networking. Will call more than one company. Can't give everyone the chance because they may not be interested. Want to make sure that the company is strong enough to take the technology. Need the proper background according to the president's technology transfer equation.

11. Do you identify possible technology that firms need? How?

Call companies to ask what they may need or their plans for the future. Try to keep an eye on industry to see changes so that can possibly identify what firms can use possible technology identified in the laboratory.

Do you focus within a certain industry or do you cover all industries within the outreach program? Yes and no. Some employees specialize in one or two outreach programs but currently I do not have a certain niche or area of focus.

12. Do you maintain a database of potential technologies and firms requiring technology?

Most of the work done is without a CRDA. WTN has kept track of technical assistant efforts. Not tracking the right data. 113 tech assistance projects beginning 1 Mar 96 and ending 17 Jul 96. Total signed CRDAs 104 at WL, 35 from WTN's efforts. Current active CRDA's is 67, 27 from WTN efforts. Also have 27 commercialization projects.

13. Do you stay involved with a firm that is acquiring technology through WTN? How long?

Throughout the whole process. Each member has a certain number of companies that are working with and routinely following up. Varies with each company. A lot of networking.

14. How mature or developed is the technology that you work with?

Varies. Covers the whole dimension.

Marketing:

15. What methods are used to advertise WL capabilities?

Several brochures that WL publishes. WTN does not publish material. Homepage. Advertisements. Mainly do the word of mouth. Facilitate what WL has. WL cannot approach industry. WTN can. WTN also understands industry and military. Industry operates differently.

16. What methods are used to implement WL strategy?

Did a marketing plan for WL

17. Do you feel you push technology to market or pull technology to an existing need? Why?

More push technology. Take technology identified by the laboratory and find companies that need the technology. Need to publish more articles on what WL does and successful transfer efforts.

Identify Vehicle:

18. What kind of transfer vehicles does WL usually use or are involved with?

Government separations, technical papers, CRDA's, commercialization vehicle

19. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything?

No. Mainly use CRDA or SBIR. Depends on company and technology. Need to determine the best mix.

Transfer:

20. Who defines the desired outcome of any transfer effort?

Everyone is involved. The outcome is not always what is expected. Mostly determined by the commercial firm.

21. Do you negotiate the terms of the transfer transaction for any of the following?

commercial firm?

No

the government?

Act as intermediary and not chose sides. Not to be biased to either sides. Look out for the AF to make sure that they receive a fair contract.

22. Who is responsible for reviewing the transactions for legal sufficiency?

Did not ask this question.

23. How are transfers authorized?

Technical assistance just happens. Each situation is different. For a CRDA WTN takes draft to JAG to make sure acceptable. Finally signed by Col Davis.

24. How long does a usual transfer effort take?

Did not ask this question.

25. How is a transfer effort closed-out?

WTN closes them out with a company only report.

Company has a database of all WTN efforts. This is of open and closed efforts.

Post-Transfer Administration:

26. Do you monitor the outcome of technology once it has been transferred? How?

Did not ask this question.

27. What kind of evaluations on transfer activities are performed in order to maintain continuous quality improvement?

Did not ask this question.

28. What kind of recognition and awards are used for transfer efforts?

Did not ask this question.

29. Are you involved in or with public relations? If so, what kind?

Did not ask this question.

30. What other areas need to be addressed that have not been?

Did not have any input to this question.

WL Management

1. What are your responsibilities?

Division chief for XPT, does transfer and transition of technology. Mainly a supervisor

2. What kind of training have you received to occupy this position?

No official training

Pilot before taking over the job. Walked in and took over the job.

3. What is your background?

Pilot with over 1000 hours of flying. Worked in C-5 program. Air mobility command commander

4. How involved do you get with the technical aspect of the technology being transferred?

Not much. Reviews CRDAs, mainly sanity check. Generic terms of technology. Make sure it is legitimate, what's good about it and what's not good about.

Strategy:

5. What kind of strategy does WL have? Is there an overall strategy or is it different for each transfer effort?

Refer to strategic plan. From strategy IPT. Have started an implementation of the plan. WTN contract for marketing helps. Starting to run things as a corporation. Run things through a business plan.

6. Do you establish transfer thrusts? How?

Industry needs to pull. What does our customer (small and medium companies) want? What are the technology needs? Broken into focused areas to look at an industry wide perspective, medical, law enforcement, general aviation, automotive, etc.

Directorates, avionics, materials. Industry need pulling on the technology.

7. Do you assign S&E's to a technology? How?

Do not assign.

8. What kind of relationship with WTN do you have?

Best contract have in the laboratory. Extremely strong relationship. WTN is extremely helpful to the state and local area. Over half of the CRDAs issued are in the state of Ohio and in the local area.

9. Who is your counter-part at WTN?

WTN President

Identify Technology:

10. Do you identify firms that require technology? How?

Sometimes. From briefing or symposiums given. Ex. Found that firefighters need a measure of their physical fitness and so now they use the AF ergometry test. Actually went out and found this information instead of the firefighters coming to the laboratory.

11. Do you identify possible technology that firms need? How?

Propulsion group is looking at areas that have the best technology that is available that can be used in the outside market. The technology is given to WTN to market. Go to high performance racing clinics to see what technology they need and can use.

12. Do you maintain a database of potential technologies and firms requiring technology?

No. Work with NTTC

13. Do you stay involved with a firm that is acquiring technology through WL? How long?

No. This is required of the S&E and focal points. Try to stay proactive to extend a CRDA if necessary before it expires.

14. How mature or developed is the technology that you work with?

61 through 78. Radar signature technology. Trying to take emerging stuff and transfer it and also take mature technology and turn it into a product.

Marketing:

15. What methods are used to advertise WL capabilities?

Word of mouth. Press release with every CRDA. A lot of briefings. WWW homepage. 1-800 number. WTN and NTTC. Conferences and tradeshows. Advertising in magazines, automotive, etc. Video clips to send out to companies once a month of four technologies. success story books. In a global competition to keeping ourselves alive and viable. Brochures. If wanted then ask for their business cards to follow-up. No real focus. lack money to go out and actively market. WTN and 3rd parties will have to be the marketing tool used unless there is a significant culture shift in the Air Force. WTN does things that I'm not able to. For me there is an unbelievable amount of paperwork required just to submit

an article for publishing in a magazine. For us to make an adjustment to a contract is like an act of congress. WTN can readily do this. WTN can hire people with marketing skills or the skills required to help the laboratory. Just developed a media IPT. Includes folks from WTN

16. What methods are used to implement WL strategy?

WTN.

17. Do you feel you push technology to market or pull technology to an existing need? Why?

Do both. Spin-on-COTS. Need to streamline the procurement activity, without limiting competition. Businesses do some research and then go out and cut a deal and its done. Some go through a more extensive level of process and that process is the level we need to determine.

Identify Vehicle:

18. What kind of transfer vehicles does WL usually use or are involved with?

CRDA's, cooperative test agreement. Simple and don't need to worry about intellectual property issues and data rights. Uses test side of the house. Be paid prior to doing the work. Do a lot of problem solving through 1-800 number. Looking at a short term CRDA. 6 month effort instead of a 18 to 24 month CRDA.

19. To what extent do you use the following mechanism:

Advisory groups

Board of Trustees for WTN,
Labs have staff meetings and
Wright Management group, a lot
of IPTs

Research Collaborations

Exchange of personnel

Trying to work this with industry
Send an engineer or someone to
industry and vice versa

Technical Assistance

A lot of this

Licensing

technology and information
Spin-off Companies

Consensus Development Efforts

Demonstration Projects

Comprehensive Centers

Information Clearhouses

Personnel Exchanges/Field Agents

Computerized Information Systems

Sad state of affairs-HQ AFMC needs to

step up to this issue and training issue.
Mandating this but not providing money
or resources to accomplish it. 1700
S&E's in the laboratory need to be

trained.

Dissemination of Information

Education

Educational outreach groups for K-12

Colloquia/Published Reports

Library Service

Collaborative R&D Projects

Yes, DARPA and competing with Army
and Navy

Other mechanism

20. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything?

No, this is what the training would be used for. Focal points

Transfer:

21. Who defines the desired outcome of any transfer effort?

Balanced effort of laboratory and customer. Real outcome is to stimulate the economy. Get the technology out there. Abtech, 3rd CRDA 3-4 SBIR project 1-man in a garage in 1988 to 40 employees to date. Used tools developed by the Government through the technology transfer acts to develop a company that has the potential of 50,000 jobs. Save industry millions of dollars through allowing industry to use test facilities already built and also saves the tax payers money in operating overhead of the facilities.

22. Do you negotiate the terms of the transfer transaction for the government?

No, Tom Kundert and WTN does this. They have or had a lawyer on their staff to help in this process. We don't understand entrepreneurship, we don't have the business practices, we don't understand venture capitalism. We don't partner in something that will be successful for both ends.

23. Who is responsible for reviewing the transactions for legal sufficiency?

Tom Kundert

24. Are you required to authorize all transfers or are WL POC's empowered to authorize their efforts?

POC's are empowered in their department. Col Davis is the one who signs. Makes sure that it is correct and if we are getting out of the core competency.

25. How long does a usual transfer effort take?

Varies from 12 to 36 months. Test facility. How much time a S&E can afford to work on this. It's flexible. Time to market, maturity, and need in the market place.

26. How is a transfer effort closed-out?

Mutual agreement between the scientist and engineer where all the tasks are completed. Test effort is complete. Commercial product is made. Terms of the agreement are met. Terminate by mutual agreement.

Post-Transfer Administration

27. Do you monitor the outcome of technology once it has been transferred? How?

No, this is a weak area. Not manned for this. WTN can do this.

28. What kind of evaluations on transfer activities are performed in order to maintain continuous quality improvement?

This is left up to the partner

29. What kind of recognition and awards are used for WL POC's on their transfer efforts?

Trying to set up better awards. Looking at all the awards available. AFMC should be doing this. WTN won the Edison Award last year. Do have design competition. General Aviation through the other core competencies.

30. Are you involved in public relations? If so, what kind?

All the time through briefings and papers.

31. What other areas need to be addressed that have not been?

Training the people. Understanding and laying out a strategic plan and working to that plan. Focus and not be all over the place. Bringing together the marketing aspects and understanding where the markets are and scoping our efforts to the points that we need to scope it. Have a need for a champion. Need support from Generals and Cols in charge. Need more dollars to be successful. Return on investment is still very pro-government verses industry. Created all of WTN contract which is creating other jobs.

WL Management

1. What are your responsibilities?

Run WL's technology transfer office; to organize; to interface with TTO office; to initiate changes in policy

2. What kind of training have you received to occupy this position?

OJT, Seminars, FLC Conferences, Supervisory courses

3. What is your background?

Worked in industry for 14 years then came to WL in the Avionics directorate.
Worked in the technology transition division then took over technology transfer.

4. How involved do you get with the technical aspect of the technology being transferred?

Not very involved. Focal point in each directorate works day to day problems for that directorate. The focal point will spend 20% to 70% of their time working tech transfer. Involvement will also include giving advise to people.

Strategy:

5. What kind of strategy does WL have? Is there an overall strategy or is it different for each transfer effort?

WL has developed a strategy which is to do as much technology transfer as possible.
Set up out-reach teams, which tries to work technology transfer the best they can.
This is a volunteer work since no funding is available.

6. Do you establish transfer thrusts? How?

Col Herrelko developed the thrusts through a Capt which developed the out-reach teams.

7. Do you assign S&E's to a technology? How?

No control over S&E's

8. What kind of relationship with WTN do you have?

Contract called a partnership intermediary, only one in the AF.

9. Has WTN helped develop Strategies?

Has not really helped in this area since they are not part of the strategy team.

10. Who is your counter-part at WTN?

May not have one, I work with all of them

Identify Technology:

11. Do you identify firms that require technology? How?

No - WTN does

WL is limited in manpower and have no time. People who call WL is how we identify firms. Once contacted - may either have them talk to WTN or will take care of them ourselves.

12. Do you identify possible technology that firms need? How?

Trying to identify more but have not done a lot of that in the past. No expertise in industry that is why have WTN.

13. Do you maintain a database of potential technologies and firms requiring technology?

No - Too many, too diverse, too hard to quantify

14. Do you stay involved with a firm that is acquiring technology through WTN?
How long?

Monitor CRDAs as long as in existence but not involved on a day to day basis.

The

S&E is the most involved and then the focal points

15. How mature or developed is the technology that you work with?

Mostly mature technology but can be new. Mostly pretty well advanced.

16. Do you use the National Technical Information Service? How?

Through WTN have access to NTTC. Mission is changing and don't use them much.

Marketing:

17. What methods are used to advertise WL capabilities?

Word of mouth, advertising in magazines, talks at seminars and conferences, Federal Laboratory Consortium (FLC), reputation

18. Does WTN help with marketing?

Yes, they do advertising and talk to small companies which WL does not do.

19. What methods are used to implement WL strategy?

WTN

20. Do you feel you push technology to market or pull technology to an existing need? Why?

Do both - Push at conferences and companies call requesting technology and it is pulled. Push to justify WL's mission - WTN can help push and pull.

Identify Vehicle:

21. What kind of transfer vehicles does WTN usually use or are involved with?

CRDA's for the most part in the formal sense. Informally, engineers talk to each other.

No real compensation during informal sense. Compensation can be cash or royalties.

22. To what extent do you use the following mechanism:

Advisory groups

Advise if it has potential

Research Collaborations

CRDA

Exchange of personnel

Trying but very limited

Technical Assistance

Consensus Development Efforts

Demonstration Projects

Do not get involved in this

Comprehensive Centers

Information Clearhouses

Yes doing this quite a bit

Licensing

Not involved in process

Spin-off Companies

none

Dissemination of Information

Magazines, Newspapers

Education

Training program for S&E's

Very involved in these areas

Colloquia/Published Reports

Seminars

Yes they can be considered this

Personnel Exchanges/Field Agents

Not yet

Computerized Information Systems

NTTC

Library Service

Collaborative R&D Projects

Some interservice

Other mechanism

Just talking to people

Possibly retiring personnel

23. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything?

Most of the time use CRDA's. No real checklist exists. Use CRDAs almost exclusively. CRDA's don't go through the procurement cycle. They are quick to get on contract. Air Force does not put any money into a CRDA - a business pays the Government but the Government does pay the firm. Trackable way to do business and it allows reimbursement.

Transfer:

24. Who defines the desired outcome of any transfer effort?

S&E and the firm

25. Do you negotiate the terms of the transfer transaction for the government?

Can when needed but don't

26. Who is responsible for reviewing the transactions for legal sufficiency?

Tom Kundert at legal AFMC LO/JAC

27. Are you required to authorize all transfers or are WL POC's empowered to authorize their efforts?

CRDA's are signed by Col Davis - WL commander.

28. How long does a usual transfer effort take?

1-2 months to get a CRDA initiated. Been working with one company for 3 years and still don't have a CRDA yet. Can take 18 months to 4 years.

29. How is a transfer effort closed-out?

At the end, a 1 page synopsis of how it was done and what happened is asked from the S&E and then it is put into DTIC but doesn't happen this way very often.

Post-Transfer Administration

30. Do you monitor the outcome of technology once it has been transferred? How?

No, lack manpower. Should do this to determine what went wrong. If transferring and have 30 CRDAs and 3 result into something really significant need to look at the others and determine what went wrong. Was it not commercially ready, was it outdated, what? Or did it have no relevance to the commercial world?

Look at where it was used. Watch and determine where used.

31. What kind of evaluations on transfer activities are performed in order to maintain continuous quality improvement?

Looking at CRDAs to determine that they are up to date. Legal and AF audit agency looks at them also.

32. What kind of recognition and awards are used for WL POC's on their transfer efforts?

Varies a great deal. Awards are given in the tech transfer efforts of S&E's.

33. Are you involved in public relations? If so, what kind?

Involved with but not involved in. The kind of public relations are advertisements and articles to go into magazines

34. What other areas need to be addressed that have not been?

WL ORTA

1. What are your responsibilities?

Process Engineer for WL technology transfer process. Develop metrics for technology transfer at WL. Keeper of stats and WL official CRDA file maintainer.

2. What kind of training have you received to occupy this position?

M.S. in management of technology, self training by reading articles on technology transfer. Also seminars.

3. What is your background?

28 years civil service. Depot maintenance, international acquisition, and R&D at WL.

4. How involved do you get with the technical aspect of the technology being transferred?

Little to none. I'm the engineer for the technology transfer process.

Strategy:

5. What kind of strategy does WL have? Is there an overall strategy or is it different for each transfer effort?

Every CRDA is unique, with a different strategy for each.

6. Do you have input in establishing transfer thrusts? How?

No.

7. Do you assign S&E's to a technology? How?

No.

8. What kind of relationship with WTN do you have?

Did not ask this question.

9. Who is your counter-part at WTN?

Nobody to my knowledge.

10. Do you identify firms that require technology? How?

No, does not go looking for firms.

11. Do you identify possible technology that firms need? How?

If I get a tasking from the gatekeeper for outside queries, then will either pass on the ML or ALC.

12. Do you maintain a database of potential technologies and firms requiring technology?

No. This is a bankrupt idea!

13. Do you stay involved with a firm that is acquiring technology through WTN? How long?

Since I am the keeper of WL metrics, I maintain a liaison with many firms, even long after the ARDA has expired.

14. How mature or developed is the technology that you work with?

Highly variable! On a scale of "maturity" from 1 to 100, I deal with technologies over the entire spectrum.

15. What methods are used to advertise WL capabilities?

Brochures, face to face contacts, published papers, informal networks, WTN, news media...

16. What methods are used to implement WL strategy?

The strategic plan and the two letter chiefs.

17. Do you feel you push technology to market or pull technology to an existing need? Why?

Do both.

Identify Vehicle:

18. What kind of transfer vehicles does WL usually use or are involved with?

CRDAs, a few licenses, some fewer patents

19. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything?

Each directorate has its own mechanisms for choosing. This is proper because the 2-letter is the only agent authorized to commit the 2-letter resources regardless of Technology transfer vehicle.

Transfer:

20. Who defines the desired outcome of any transfer effort?

The S&E negotiates what is advantageous to WL and champions the agreement to his/her 2-letter.

21. Do you negotiate the terms of the transfer transaction for the government?

No.

22. Who is responsible for reviewing the transactions for legal sufficiency?

For CRDAs JAZ does and for test agreements JAN.

23. Are you required to authorize all transfers or are the WL POC's empowered to authorize their efforts?

Did not answer this question.

24. How long does a usual transfer effort take?

There is no usual effort. Each CRDA is different.

25. How is a transfer effort closed out?

We are struggling with this at present. Up to now I have been apprising our directorates of CRDAs expiring in the next 6 months. the CRDAs default to expired status when the legal date is exceeded unless extensions are made in a timely manner. Other close outs by letter from our partner or from the S&E.

Post-Transfer Administration:

26. Do you monitor the outcome of technology once it has been transferred? How?

No. We do not have any resources to track this massive undertaking. It is a ridiculous idea!!

27. What kind of evaluations on transfer activities are performed in order to maintain continuous quality improvement?

I maintain SPC charts, constantly creating better, more detailed, and cost-effective strategies for the technology transfer process. Other ORTA individuals tweak their functions as needed.

28. What kind of recognition and awards are used for WL POC's on their transfer efforts?

WL has instituted technology transfer awards.

29. Are you involved in or with public relations? If so, what kind?

I have a large involvement with the PR office. DOR maintains the traveling WL van.

30. What other areas need to be addressed that have not been?

Did not answer this question.

WL Focal Point

1. What are your responsibilities?

To determine what mechanism to use when attempting technology transfer. To interface with intellectual property lawyers

2. What kind of training have you received to occupy this position?

Mainly OJT

3. What is your background?

Bachelors in Mechanical Engineering

4. How involved do you get with the technical aspect of the technology being transferred?

Depends - Need to know enough to mediate between business personnel and scientists.

Strategy:

5. What kind of strategy does WL have? Is there an overall strategy or is it different for each transfer effort?

Based on strategic plan developed a year ago but not enforced. It is mainly left to the individuals for what works best for them. Each one prioritizes and strategizes their own plan. Do business as usual.

6. Do you have input in establishing transfer thrusts? How?

Yes she did. Medical and Auto were first.

7. How are S&E's assigned to a technology?

Each directorate has core competencies and the S&E's are assigned based on mission needs.

8. What kind of relationship does WTN and WL have?

The relationship is getting better. More business experience and understanding that WTN is a separate entity from the Air Force is helping.

9. Who is your counter-part at WL?

Technical specialists

Identify Technology:

10. Do you identify firms that require technology? How?

No. Firms come to WL. Also WTN does this and weed out businesses. WL will generalize a technology in an industrial field.

11. Do you identify possible technology that firms need? How?

Need WTN to perform market analysis

12. Do you maintain a database of potential technologies and firms requiring technology?

No.

13. Do you stay involved with a firm that is acquiring technology through WTN?
How long?

No.

14. How mature or developed is the technology that you work with?

All levels

Marketing:

15. What methods are used to advertise WL capabilities?

Ads, newspapers, trade shows

16. Do you feel you push technology to market or pull technology to an existing need?
Why?

Both, mostly push but sometimes pull. WTN has helped with the pull from industry.

Identify Vehicle:

17. What kind of transfer vehicles does WL usually use or are involved with?

CRDA's, S/W licensing agreements, Patent licensing agreements

18. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything?

No. Legal helps identify if using the wrong vehicle or which vehicle would be the best

Transfer:

19. Who defines the desired outcome of any transfer effort?

Engineer and company or firm

20. Do you negotiate the terms of the transfer transaction for the government?

sometimes, if needed to bring both parties together

21. Who is responsible for reviewing the transactions for legal sufficiency?

Legal, Tom Kundert

22. How are transfers authorized?

The Division or Branch chief . The approving authority is Col Davis

23. How long does a usual transfer effort take?

Depends on the firm and the engineers

24. How is a transfer effort closed-out?

Suppose to be a one-page report that will be used for DTIC. The engineer is responsible for this.

Post-Transfer Administration

25. What kind of evaluations on transfer activities are performed in order to maintain continuous quality improvement?

No formal evaluations. Keep track of what went wrong and lessons learned.

26. Are you involved in or with public relations? If so, what kind?

Yes, review papers, articles, and track technology.

27. What other areas need to be addressed that have not been?

WTN is good when companies come to them and are helpful as an outsider for advise and marketing perspectives.

WL S&E

1. What are your responsibilities?

Close-out of NASP, obligation of expenditure on the hypersonic program, CRDA with Space Access

2. What kind of training have you received to occupy this position?

Officer in AF. No training in technology transfer. Engineering degree.

3. What is your background?

24 years AF experience, 21 in Acq, BS and MS in EE

Strategy:

4. What kind of relationship does WTN and WL have?

Have a really close relationship from this one CRDA
Guided an inexperienced person through the CRDA process

5. Who is your counter-part at WL?

Do not know if there is one.

Identify Technology:

6. How do you identify firms that require technology?

Most of effort is in the technology itself and not aware of what industry is looking for. Don't know how to convert technology to commercial need.

7. How do you identify possible technology that firms need?

Industry background helped WTN to make a CRDA possible. Because of background and contacts were able to find proper funding to make the CRDA possible. Since this was not a typical case WTN really was able to help. Does not feel ORTA and other offices could help. Reserve officers act like WTN because they work with industry everyday. Provide insight to help understand how industry is thinking. Knew what kind of technology a company is looking for and also how the military works.

8. Do you stay involved with a firm that is acquiring technology through WTN?
How long?

Did not ask this question.

9. How mature or developed is the technology that you work with?

State of the art.

Marketing:

10. What methods are used to advertise WL capabilities?

Book of points of contacts, Industry days, Don't know if reaching all the possible companies that may have an interest in technology. Missing a lot of opportunities

11. What methods are used to implement WL strategy?

Did not ask this question.

12. Do you feel you push technology to market or pull technology to an existing need? Why?

Push experience. Wonder if not hearing or receptive of the pull requirements from industry at this point. If heard of pull requirements would be able to tailor programs to meet those areas.

Identify Vehicle:

13. What kind of transfer vehicles does WL usually use or are involved with?

Only been involved with a CRDA

14. Is there a checklist used to know what kind of vehicle to use or is there usually just one used for everything? If not, how do you know which one to use?

Do not know.

Transfer:

15. Who defines the desired outcome of any transfer effort?

Industry takes the lead. Their need. But there are a lot of ways to fulfilling a need so the S&E's job is to identify at least one way to meet the need. Then industry looks into if it fits the need financially, maintainability, and producable by them.

16. How involved do you get during negotiation of the terms of the transfer transaction for the government?

Very involved. Needed to first what was allowable and how the AF does business. Help with identifying the risks and trade-offs. WTN helped in identifying the different approaches and opportunities.

17. Who is responsible for reviewing the transactions for legal sufficiency?

Legal office.

18. How are transfers authorized?

Depends on the degree of involvement. If a couple of weeks or so than are empowered to work the transfer effort. Is there a particular threshold that makes it all right to work a transfer effort without it being formal. Not clear where the threshold is. May be an area of study for the future.

What value is there to the AF to help a company and transfer technology or knowledge when there is no monetary reimbursement made?

The strength of the nation is the strength of industry. In economic combat. Makes the overall economy better. Through a small effort can make our nation grow.

Taxpayers pay salary and so if can pay some of that back not only during times of war but times of peace. Its a good will thing.

Do you measure or keep track of technical assistance made?

No don't keep track of the smallest assistance done. Do measure big projects and what kind of sales those are having. Did it really turn out as good as projected.

What can be learned from it. This is where he would measure.

19. How long does a usual transfer effort take?

Do not know.

Post-Transfer Administration

20. Do you monitor the outcome of technology once it has been transferred? How?

Depends on the agreement worked. The NASP program had a separate office made to monitor what the outcome was of technology transferred. Very important to helping justify the NASP program for a while. Show tangible results.

21. What kind of recognition and awards are used for transfer efforts?

There are awards but not familiar with how the process works.

22. What other areas need to be addressed that have not been?

The facilitating of the smaller efforts and assistance which can lead to larger efforts and also the good will aspects of it. A small investment in time can reap huge benefits in the support of what the AF is trying to do. Smaller efforts need more emphasis.

Bibliography

- Air Force Materiel Command (AFMC) Technology Transfer Handbook, Aeronautical Systems Center, Wright-Patterson AFB OH, 1995.
- Baron, Seymour. "Overcoming Barriers to Technology Transfer," Research-Technology Management, 38-43 (January-February 1990).
- Bodde, David L. "On Guns and Butter: Reflections on Technology Transfer from Federal Laboratories," Technology in Society, 15: 273-280 (1993).
- Bozeman, Barry and Michael Crow. "Technology Transfer From U.S. Government and University R&D Laboratories," Technovation, 11: 231-246 (1991).
- Bryman, Alan. Research Methods and Organizational Studies. Winchester MA: Unwin Hyman Inc., 1989.
- Carr, Robert K. "Doing Technology Transfer in Federal Laboratories (Part 1)," Journal of Technology Transfer, 17: 8-23 (Spring-Summer 1992).
- Chakrabarti, Alok K. and Israel Dror. "Technology Transfer and Knowledge Interactions Among Defense Firms in the USA: An Analysis of Patent Citations," International Journal of Technology Management, 9: 757-770 (5/6/7, 1994)
- Charles, Daniel. "Labs Struggle to Promote Spin-Offs," Science, 240:874-876 (13 May 1988).
- Cooper, Donald R. and C. William Emory. Business Research Methods. Chicago: Richard D. Irwin Inc., 1995.
- Cordes, Colleen. "Does Technology Policy Create or Eliminate Good Jobs?," The Chronicle of Higher Education. A28-A29 (17 March 1995).
- Defense Science and Technology Strategy, Unpublished Report, Sep 1994
- Friedman, Donald S. "Small Business Innovation Research Program and Technology Transfer," SPIE, 2270: 210-211 (April 1994)
- Gover, James. "Optimizing Federal Technology Transfer to Promote Commercialization," Journal of Technology Transfer, 36-49 (December 1994).

- Palmintera, Diane. "Extension Services and Intermediaries: Brokering Federal Technologies to Smaller Firms," Journal of Technology Transfer, 16-23 (Summer-Fall 1993).
- ✓ Phillips Laboratory. Technology Transfer Business Plan Fiscal Year 96. Albuquerque: Kirtland Air Force Base, 6 March 1996.
- (Roessner, J. David. "What Companies Want From the Federal Labs," Issues in Science and Technology: 36-42 (Fall 1993).
- Salvador, Marissa C. Assisting Defense Conversion Technology Transfer Efforts: A Case Study of Ohio's Miami Valley. MS thesis, AFIT/GSM/LAL/95S-6. School of Logistics and Acquisition Management, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1995 (AD-A 300509).
- Schmitt, N.W. and R.J. Klimoski. Understanding the Organization Through Qualitative Research. Cincinnati: Southwestern Publishing, 1991.
- Scott, William B. "U.S. Labs Embrace Technology Transfer," Aviation Week and Space Technology, 139(8): 64-66 (23 August 1993).
- Scott, William B. "Tech Transfer Impact Remains Elusive," Aviation Week and Space Technology. 42-44 (7 November 1994)
- Shahidi, Hassan and Lan Xue. "Federally Funded Research and Development Centers (FFRDCs) and Technology Transfer," Proceedings of the IEEE 1994 International Engineering Management Conference "Management in Transition: Engineering a Changing World". 149-157. New York: IEEE, 1994.
- Smith, Brett. The Process of Technology Transfer: A Case Study of the National Aero-Space Plane Program. MS thesis, AFIT/GSM/LAS/95S-8. School of Logistics and Acquisition Management, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1995 (AD-A 300506).
- Souder, Wm. E., Ahmed S. Nashar, and Venkatesh Padmanabhan. "A Guide to the Best Technology Transfer Processes," Technology Transfer: 5-14 (Winter-Spring 1990).
- Wright Technology Network. Wright Technology Network (WTN) Overview. Company Slides. Dayton OH. no date [1996].
- Yin, Robert K. Case Study Research: Design and Methods. Newbury Park CA: Sage Publications Inc., 1989.

Vita

Captain David A. Taylor was born 14 March 1967 in Salt Lake City, Utah. He Graduated from Kanab High School, Kanab, Utah in May 1985 and graduated from Brigham Young University with a BS degree in Mathematics in December 1991. After receiving his commission through the AFROTC program, Lt. Taylor attended a six week Acquisition Fundamentals course at Lowry AFB, CO, before assignment to his first duty station, Nellis AFB, Nevada. He was the contract program manager for the Red Flag Measurement and Debriefing System contract and as an assistant contract program manager for the operation and maintenance contracts in support of the Nellis Range complex. In May 1995 he entered the School of Acquisition and Logistics, Air Force Institute of Technology, to receive a degree in Systems Management. After graduating from AFIT, he will serve as an Acquisition Project Officer for the F-15 SPO, Wright Patterson AFB, Ohio.

Permanent Address: 228 North 150 East
Kanab, Utah 84741

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 074-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE September 1996		3. REPORT TYPE AND DATES COVERED Master's Thesis
4. TITLE AND SUBTITLE THE UTILITY OF USING THIRD PARTIES IN MILITARY TO COMMERCIAL TECHNOLOGY TRANSFER			5. FUNDING NUMBERS	
6. AUTHOR(S) David A. Taylor, Captain USAF				
7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S) Air Force Institute of Technology 2950 P Street WPAFB OH 45433-7765			8. PERFORMING ORGANIZATION REPORT NUMBER AFIT/GSM/LAS/96S-7	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) AFMC/TTO Technology Transfer Office Wright Patterson AFB OH 45433-5006			10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution unlimited			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 Words) In the wake of the defense drawdown and end of the Cold War, government laboratories are facing a changing mission. It is not only to maintain technology superiority, but also to promote commercialization of their technologies. Although Congress has tried to facilitate technology transfer from the government to the private sector, the transfer process has been inconsistent. The need for assistance has initiated the use of third parties or intermediaries in the technology transfer process. This thesis evaluates the utility of a third party in the technology transfer process. An examination of Wright Technology Network (WTN), a third party, is used to form a case study of its value added to Wright Laboratory (WL) in striving to meet WL's mission. Interviews with employees at WTN and WL are used to obtain the data for this case study. The key findings of this research suggest recommendations that can be applied to understand the utility of third parties. Some key findings found include: Third parties assist firms in targeting and defining a technology problem or interest and third parties facilitate the transfer process through their ties with industry. Opportunities for additional research in this area are also offered.				
Technology Transfer, Transfer, Case Studies, Thesis,			15. NUMBER OF PAGES 129	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UNCLASSIFIED	

AFIT RESEARCH ASSESSMENT

The purpose of this questionnaire is to determine the potential for current and future applications of AFIT thesis research. **Please return completed questionnaire to:** AIR FORCE INSTITUTE OF TECHNOLOGY/LAC, 2950 P STREET, WRIGHT-PATTERSON AFB OH 45433-7765. Your response is **important**. Thank you.

1. Did this research contribute to a current research project? a. Yes b. No

2. Do you believe this research topic is significant enough that it would have been researched (or contracted) by your organization or another agency if AFIT had not researched it?
a. Yes b. No

3. **Please estimate** what this research would have cost in terms of manpower and dollars if it had been accomplished under contract or if it had been done in-house.

Man Years _____ \$ _____

4. Whether or not you were able to establish an equivalent value for this research (in Question 3), what is your estimate of its significance?

a. Highly b. Significant c. Slightly d. Of No
Significant Significant Significance

5. Comments (Please feel free to use a separate sheet for more detailed answers and include it with this form):

Name and Grade

Organization

Position or Title

Address